CDD-562L/564

Demodulator with IP Module
Installation and Operation Manual

(Includes data for the CDD-562L, CDD-564, and CDD-564L Configurations)

For Firmware Version 1.6.0 or higher

(see *New in this Release* – Section 1.4)

Comtech EF Data is an AS9100 Rev B / ISO9001:2000 Registered Company

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding these products. Product specifications are subject to change without prior notice.

Part Number MN/CDD564L.IOM Revision 1

Errata A

Comtech EF Data Documentation Update

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AS9100 Rev B / ISO9001:2000
Registered Company

Part Number MN/CDD564L.IOM
Revision 1
October 28, 2009

Subject:	Replace Flash Upgrading Procedure
Date:	April 28, 2010
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Agile CO Number:	CO 11666
Comments:	Affected manual page content will be updated, as indicated below, upon next formal manual revision.
Affected content:	**Chapter 4. FLASH UPGRADING** Replace Chapter 4. FLASH UPGRADING (pp. 4-1 through 4-4) in its entirety with the content provided in this Errata on pages 3 through 6.

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Chapter 4. FLASH UPGRADING

4.1 Flash Updating via Internet

The CDD-56X Satellite Demodulator with IP Module eliminates the need for updating firmware by physically replacing EPROMs. Instead, the demodulator uses 'Flash memory' technology internally. This makes software upgrading very simple, and updates can now be sent via the Internet (**Figure 4-1**), via E-mail, or on CD.

This chapter outlines the complete upgrading process as follows:

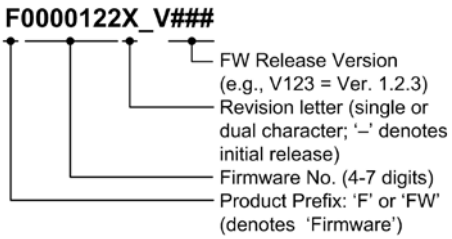
- New firmware can be downloaded via the Internet to an external PC.
- The upgrade can be performed without opening the demodulator by simply connecting the unit to the Ethernet port of a computer.
- The firmware update is transferred, via File Transfer Protocol (FTP), to the demodulator.

Figure 4-1. Flash Update via Internet

4.2 About Firmware Files, Naming, Versions, and Formats

All CEFD products are shipped configured with the current version firmware release. Firmware upgrades may be obtained from Comtech EF Data via download from the Internet to an external PC, via e-mail, or on CD.

Comtech EF Data's Web site catalogues its firmware upgrade files by product type (e.g., modem, converter, etc.) and specific model/optional configuration. The hyperlinks appear as per the example to the right. In this example, the **F0000122X_V###** firmware hyperlink is depicted (the linked file applies to Ver. 1.6.3 and earlier operation *without* the 3xDES Encryption option), where 'X' denotes the revision letter, and ### represents the firmware version.


F0000122X_V###
FW Release Version (e.g., V123 = Ver. 1.2.3)
Revision letter (single or dual character; '–' denotes initial release)
Firmware No. (4-7 digits)
Product Prefix: 'F' or 'FW' (denotes 'Firmware')

The CDD-562L/564 is optionally available with 3xDES Encryption. The desired firmware upgrades are available from Comtech EF Data per the following table:

Web Hyperlink	EXE/ZIP Filename	Contains Image File (* denotes revision letter)
F0000122X_V###	FW0000122X	FW-0000122*.bin – Ver. 1.6.3 (and earlier) with HDLC Encapsulation, *without* 3xDES Encryption option
N/A	Contact CEFD	FW11669*.bin – Ver. 1.6.3 (and earlier) with HDLC Encapsulation, *with* 3xDES Encryption option
F0000364X_V###	FW0000364X	FW-0000364*.bin – Ver. 1.7.0 (and later) with Streamline Encapsulation, *without* 3xDES Encryption option
F0000362X_V###	Contact CEFD	FW-0000362*.bin – Ver. 1.7.0 (and later) with Streamline Encapsulation, *with* 3xDES Encryption option

IMPORTANT

Ver. 1.7.0 firmware (featuring Streamline Encapsulation) is* not *compatible with Ver. 1.6.x firmware (featuring HDLC Encapsulation).

Only firmware for the CDD-562L/564 without the 3xDES Encryption option is available for download from the CEFD Web site. To obtain the firmware upgrade for the CDD-562L/564 with the 3xDES Encryption option, the user must Contact Network Product Customer Support:

Phone – 480.333.2433

E-mail – cdmipsupport@comtechefdata.com.

The firmware download files are available from Comtech EF Data in two file formats: ***.exe** (self extracting) and ***.zip** (compressed). Some firewalls will not allow the downloading of *.exe files; in this case, download the *.zip file instead. If applicable, one version prior to the current release is also available for download.

(**Note:** For additional help with "zipped" file types, refer to the help files provided with the "PKZIP for Windows", "WinZip", or "ZipCentral" file archiving programs. "PKZIP for DOS" is not supported due to file naming conventions.)

To verify the correct firmware number, see **Step 1** in the next section of this guide, **II. Preparation for the Ethernet FTP Upload Procedure**.

4.3 Ethernet FTP Upload Procedure

Note: If Steps 1 through 5 of this procedure have already been completed using CEFD document *Re-Flashing Your Comtech EF Data Product* (FLG-FLASHINTRO_rx.pdf, where 'x' is the document revision number), continue on to **Sect. 4.4. Base Unit Bulk Firmware Upgrade – Ethernet FTP Upload Procedure.**

Step	Procedure
1	**Identify the reflashable product**, firmware number, and version for download: • Using the 10/100 Ethernet port, **via Telnet and the Command Line Interface (CLI),** view the unit information by first typing '**O** <*CR*>' (**Operations and Maintenance** is selected), then by typing '**I** <*CR*>' (**Unit Information** is selected). For more information on using this interface, refer to **Chapter 9. IP MODULE – CLI AND TELNET OPERATION** in the *Installation and Operation Manual*. • Using the 10/100 Ethernet port, **via HTTP and the IP Module Web server Interface**, view the unit information by first clicking the **Maint** (Maintenance) tab, then clicking the **Unit Info** hyperlink. For more information on using this interface, refer to **Chapter 8. WEB SERVER (HTTP) INTERFACE** in the *Installation and Operation Manual*.
2	**Create a temporary directory** (folder) on the PC: **Windows**: Select **File → New → Folder** and rename the "New Folder" to "temp" or another unused name. A "***c:\temp***" folder should now exist. **Note:** The **c:** is the drive letter used in this example. Any valid, writable drive letter can be used. ***CMD prompt:*** At the command prompt (c:\>) type "**MD temp**" or "**mkdir temp**" without quotes (**MD** and **mkdir** stand for ***make directory***). A "***c:\temp***" subdirectory should now exist, where **c:** is the drive letter used in the example.
3	**Download the correct firmware file** to this temporary folder. As shown in **Figure 4-1**: a) **Go online to: www.comtechefdata.com;** b) **Click on: *Support*** tab; c) **Click on: *Software Downloads*** drop-down *or* hyperlink from ***Support*** page; d) **Click on: *Download Flash and Software Update Files*** icon; e) **Click on: *(Select a Product Line:) Satellite Modems*** hyperlink; f) **Select** the ***CDD-562L/564/L*** product hyperlink; g) **Select** the appropriate firmware hyperlink (i.e., *without* 3xDES) **or** contact CEFD Customer Support to obtain the download *with* 3xDES. Refer to the table in **Sect. 4.2 About Firmware Numbers, File Versions, and Formats** in this chapter for the naming and availability of the firmware download hyperlinks, archive files, and downloaded image files.
4	**Extract the files** to the temporary folder on the PC. A minimum of four files should be extracted: • *Without 3xDES* – **FW-0000122x.bin** (Ver. 1.6.3 and earlier) *–or–* **FW-0000364x.bin** (Ver. 1.7.0 or later). Note that 'x' denotes the revision letter of the image file. ***–or–*** • *With 3xDES* – **FW11669x.bin** (Ver. 1.6.3 and earlier) *–or–* **FW-0000362x.bin** (Ver. 1.7.0 or later). Note that 'x' denotes the revision letter of the image file. • **CDD 56x L X.X.X Release Notes.pdf** (or a variation of this filename); • **CDD 56x L X.X.X Upgrade** (or a variation of this filename) – Installation notes; • **FLG-CDD564L_rx.pdf** – The Firmware Upgrade Guide (where 'x' is the document revision number).

5	**Confirm that the files have been extracted** to the specified temporary folder on the PC. In DOS, use "**cd c:\temp**" to change to the temporary directory created in **Step 2**, then use the "**dir**" command to list the files extracted from the downloaded archive file.

4.4 Base Unit Bulk Firmware Upgrade – Ethernet FTP Upload Procedure

Step	Procedure
6	**Connect the external PC** to the CDD-562L/564's 10/100 Ethernet M&C port via a hub or a switch, or directly to a PC with a crossover cable.
7	**Send a "ping" command** to the demodulator to verify the communication and connection. Determine the IP address of the demodulator either remotely or by using the front panel: • **Using DOS to ping:** Click "**Start**" on the Windows toolbar, then select the "**Run...**" option. (Alternately, use the "**DOS Prompt**" or "**Command Prompt**" icons in the **Start Menu**.) • **Using Win95 or Win98:** Type "**command**". • **Using WinNT, Win2K or WinXP:** Type "**cmd**". Once in DOS, use "**cd c:\temp**" to change to the temporary directory created earlier in **Step 2**. Use the "**dir**" command to list the downloaded files.
8	**Initiate an FTP session** with the demodulator (this example uses a DOS window): a) **From the PC**, type "**ftp xxx.xxx.xxx.xxx**" where '**xxx.xxx.xxx.xxx**' is the IP address of the CDD-562L/564. b) Enter the **Admin User Name** and **Password** to complete login. c) Verify the FTP transfer is binary by typing "**bin**". d) Type "**prompt**", then type "**hash**" to facilitate the file transfers.
9	**Transfer the files** from the temporary folder on the PC: Type "**put FW#######x.bin**" (where '#######' is the designated firmware file number, and 'x' is the revision letter) to begin the file transfers. The process sequences through several blocks – this may take several minutes. When the upgrade image has been received, the image will be written to flash memory.
10	**Change the desired image to boot.** By default, the demodulator will boot to the version with the *latest date* (**Boot to – Latest**). "**Boot to**" can also be set to force the demodulator to boot up using either **Image #1** or **Image #2**. The unit will then need to be reset (i.e., rebooted or power cycled) from the serial console, Web Server Interface, or CLI/Telnet for the firmware upgrade selection to become active: • **To reset from the Web Server Interface**, select the **Maint | Reboot page**, then click **[Yes, Reboot].** • **To reset from the CLI/Telnet Main Menu**, select **Operations and Maintenance [O]**, then select **Reset [R]**.

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CDD-562L (L-Band) Dual, CDD-564 (70/140 MHz) Quad, and CDD-564L (L-Band) Quad Demodulator with IP Module. The demodulators include support for externally connected LNBs.

This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the demodulator.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department:

TechnicalPublications@comtechefdata.com.

Conventions and References

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-metric to metric conversions.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations.

Cautions and Warnings

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.

IMPORTANT or NOTE Indicates information critical for proper equipment function.

Electrical Safety

These Comtech EF Data demodulators have been shown to comply with safety standard ***EN 60950: Safety Of Information Technology Equipment, Including Electrical Business Equipment***.

The equipment is rated for operation over the range 100 - 240 volts AC. It has a maximum power consumption of 140 Watts (when all inputs are supplying DC to LNBs), and draws a maximum of 1.5 Amps.

The user should take care to observe the following information and/or instructions.

Environmental

The demodulator must not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50°C, precipitation, condensation, or humid atmospheres above 95% RH, altitudes (non-pressurized) greater than 2000 meters, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

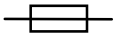
Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed.

Installation

The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The demodulator is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to a power system that has no direct connection to ground.

The demodulator is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification. Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

International Symbols			
Symbol	**Definition**	**Symbol**	**Definition**
~	Alternating Current		Protective Earth
	Fuse		Chassis Ground

Telecommunications Terminal Equipment Directive

In accordance with the Telecommunications Terminal Equipment Directive 91/263/EEC, this equipment should not be directly connected to the Public Telecommunications Network.

EMC (Electromagnetic Compatibility)

In accordance with European Directive 89/336/EEC, the demodulator has been shown, by independent testing, to comply with the following standards:

Emissions and Immunity: EN301489-1 (Also tested to FCC Part 15 Class B)

EN 301489-1 complies with the following standards:

EN55022 Class B	*Limits and Methods*
EN 61000-3-2	*Harmonic Currents Emission*
EN 61000-3-3	*Voltage Fluctuations and Flicker*
EN 61000-4-2	*ESD Immunity*
EN 61000-4-4	*EFT Burst Immunity*
EN 61000-4-5	*Surge Immunity*
EN 61000-4-6	*RF Conducted Immunity*
EN 61000-4-8	*Power frequency Magnetic Field Immunity*
EN 61000-4-9	*Pulse Magnetic Field Immunity*
EN 61000-4-11	*Voltage Dips, Interruptions, and Variations Immunity*
EN 61000-4-13	*Immunity to Harmonics*

To ensure that the Modem continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive IF ports (‘N’ type female connectors) should be made using a good quality coaxial cable - for example, RG213/U.
- All 'D' type connectors attached to the rear panel must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back-shell.
- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly re-fitted before normal operation commences.

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Customer Support

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Reporting comments or suggestions concerning manuals
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data number)
480.333.4357 (Customer Support Desk)
480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.
- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.
- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Online Customer Support

An RMA number request can be requested electronically by contacting the Customer Support Department through the online support page at **www.comtechefdata.com/support.asp**:

- **Click** on "**Service**" for detailed instructions on our return procedures.
- **Click** on the "**RMA Request** Form" hyperlink, then fill out the form completely before sending.
- **Send e-mail** to the Customer Support Department at **service@comtechefdata.com**.

For information regarding this product's warranty policy, refer to the Warranty Policy, p. xvi.

Chapter 1. INTRODUCTION

1.1 Overview

The CDD-562L (**Figure 1-1**) is a dual (2-channel) L-Band satellite demodulator. The CDD-564L (**Figure 1-2**) is a quad (4-channel) L-Band satellite demodulator; the CDD-564 is the 70/140 MHz IF version of the same demodulator – apart from the IF frequency band, these two demodulators are essentially identical.

Equipped with IP router, these demodulators are intended for closed network applications.

Figure 1-1. CDD-562L L-Band Satellite Dual Demodulator

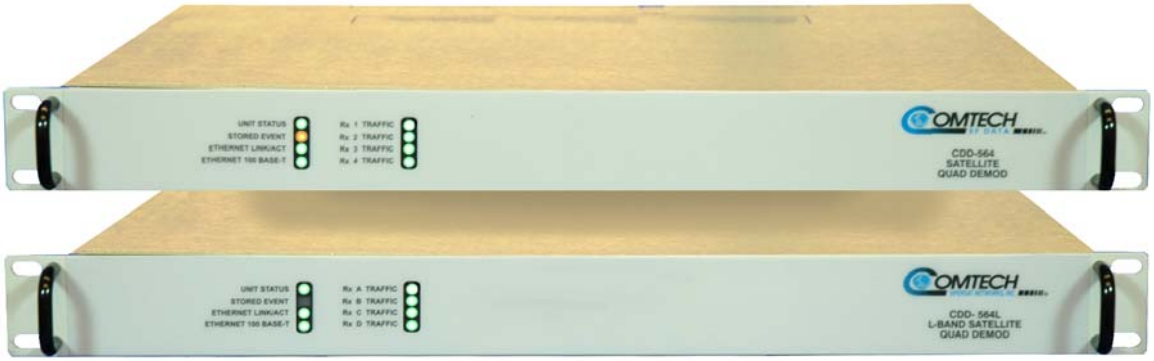


Figure 1-2. CDD-564/564L 70/140 MHz / L-Band Satellite Quad Demodulators

For the purpose of brevity, the product will be referred to hereafter as either "*the demodulator*" or "the *CDD-56X*". If the need arises to distinguish between the units, the specific model number will be identified.

Observe the following:

- Fast acquisition demodulator:
  - *CDD-562L:* Two independent demodulators
  - *CDD-564/564L:* Four independent demodulators
- *CDD-564:* Demodulator programmed from 50 – 90, 100 – 180 MHz IF range (70-140 MHz)
- *CDD-562L/CDD-564L:* Demodulators programmed from 950 – 1950 MHz (L-Band)
- **Optional:** Variable data rates from 16 kbps to 9.98 Mbps
- **Optional:** Rates above 512 kbps
- 2nd Generation Turbo Product Coding (TPC) Forward Error Correction (FEC)
- QPSK modulation
- **Optional:** 8-PSK and 16-QAM
- SNMP, HTTP (Web server), and Telnet
- LNB Support: 10 MHz reference and LNB power

1.2 Functional Description

The CDD-562L has two Rx channels. The CDD-564/564L have four Rx channels.

The demodulators have two fundamentally different types of interface: **Ethernet** and **IF**.

The Ethernet interface is a bi-directional path, which connects with the customer's equipment through an Ethernet Switch. The Ethernet interface is a 10/100 BaseT Ethernet port where data flow is the combined output of the demodulator channels. Control and status information also uses this port.

The IF interfaces provides independent unidirectional links (receive only) with the satellite via the downlink equipment.

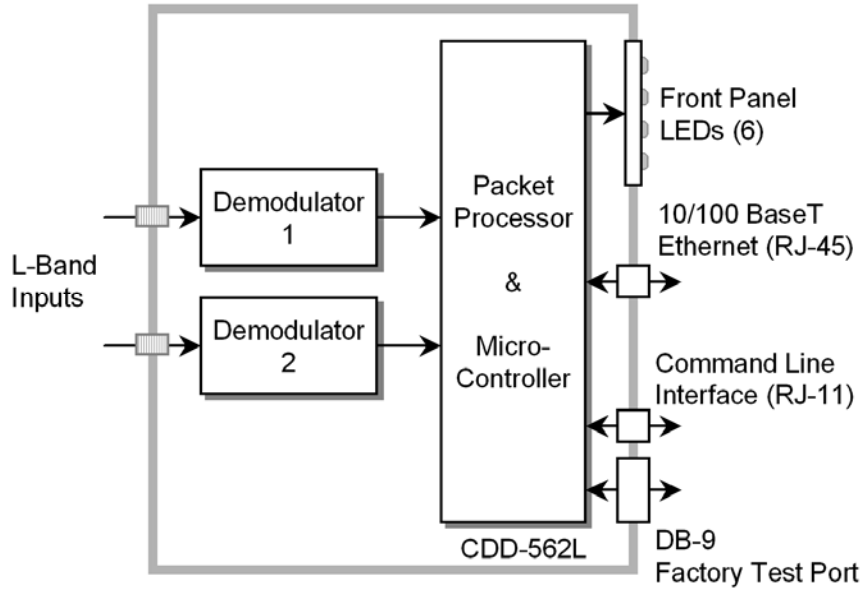
In the demodulator, the Rx IF signal in the range (*50 – 90 or 100 – 180 MHz for 70/140 MHz units, and 950–1950 MHz for L-Band units*) is translated to an intermediate frequency **(**approx. 465 MHz for L-Band), and then further translated to baseband using the carrier recovery VCO. This is a complex mix, resulting in the signal once more being split into an in-phase (I) and a quadrature (Q) component.

An AGC circuit maintains the desired signal level constant over a broad range. Following this, the I and Q signals are sampled by high-speed (flash) A/D converters. All processing beyond this conversion is purely digital, performing the functions of Nyquist filtering, carrier recovery, and symbol timing recovery. The resultant demodulated signal is fed, in soft decision form, to the selected FEC decoder (Turbo).

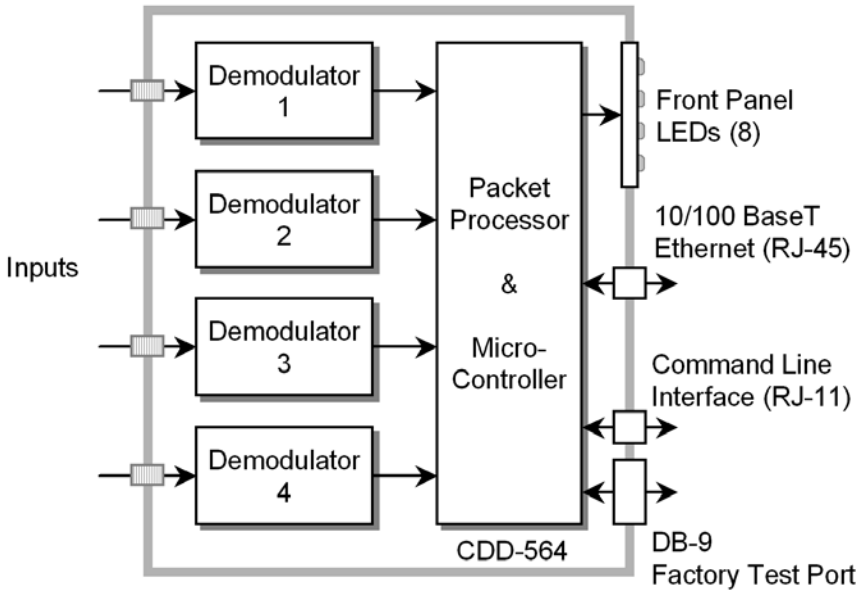
After decoding, the recovered clock and data pass to the IP Module where traffic is examined and processed for four channels before it is delivered to the Ethernet port.

The demodulator signal processing functions are performed in two, large **F**ield-**P**rogrammable **G**ate **A**rray (FPGA), which permits rapid implementation of changes, additions and enhancements in the field. These signal-processing functions are controlled and monitored by a 32-bit RISC microprocessor, which also controls all front panel indicators, serial and Ethernet interfaces.

As shown in the block diagrams depicted in **Figure 1-3**, the demodulator is physically comprised of a single printed circuit board assembly, with integral Turbo FEC and IP router.



CDD-562L Block Diagram



CDD-564/564L Block Diagram

Figure 1-3. CDD-5xx Block Diagrams

1.3 Features

1.3.1 Physical Description

The demodulators are constructed as a 1RU-high, rack-mounting chassis, which can be freestanding if desired. Rack handles at the front facilitate removal from and placement into a rack.

1.3.2 Interoperability/Compatibility

The demodulator is interoperable with the Comtech EF Data CDM-570 and CDM-570L Satellite Modems populated with the optional IP Module/router, as well as other Comtech EF Data IP-enabled products (including modems and Performance Enhancement Proxies). The demodulator supports the functions associated with receive side of the equipment.

1.3.3 Major Assemblies

Model	Assembly	Description
CDD-562L/564L	PL/10915-1	AC Chassis
	PL/10915-2	DC Chassis
CDD-564	PL/11548-1	AC Chassis
	PL/11548-2	DC Chassis
CDD-562L	PL/10735-2	Demodulator Card
CDD-564L	PL/10735-1	Demodulator Card

1.3.4 Dimensional Envelopes

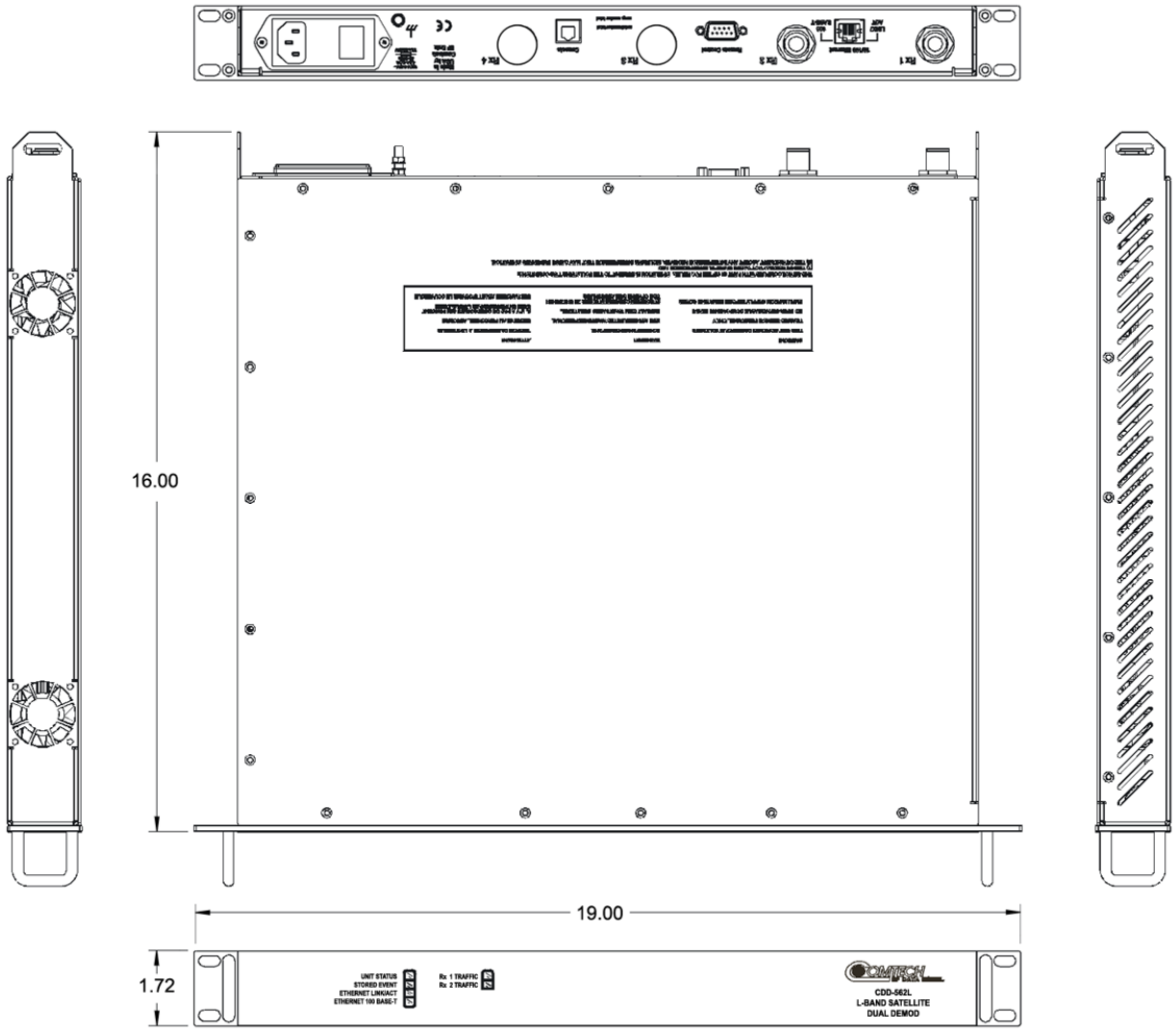


Figure 1-4. CDD-562L Dimensional Envelope

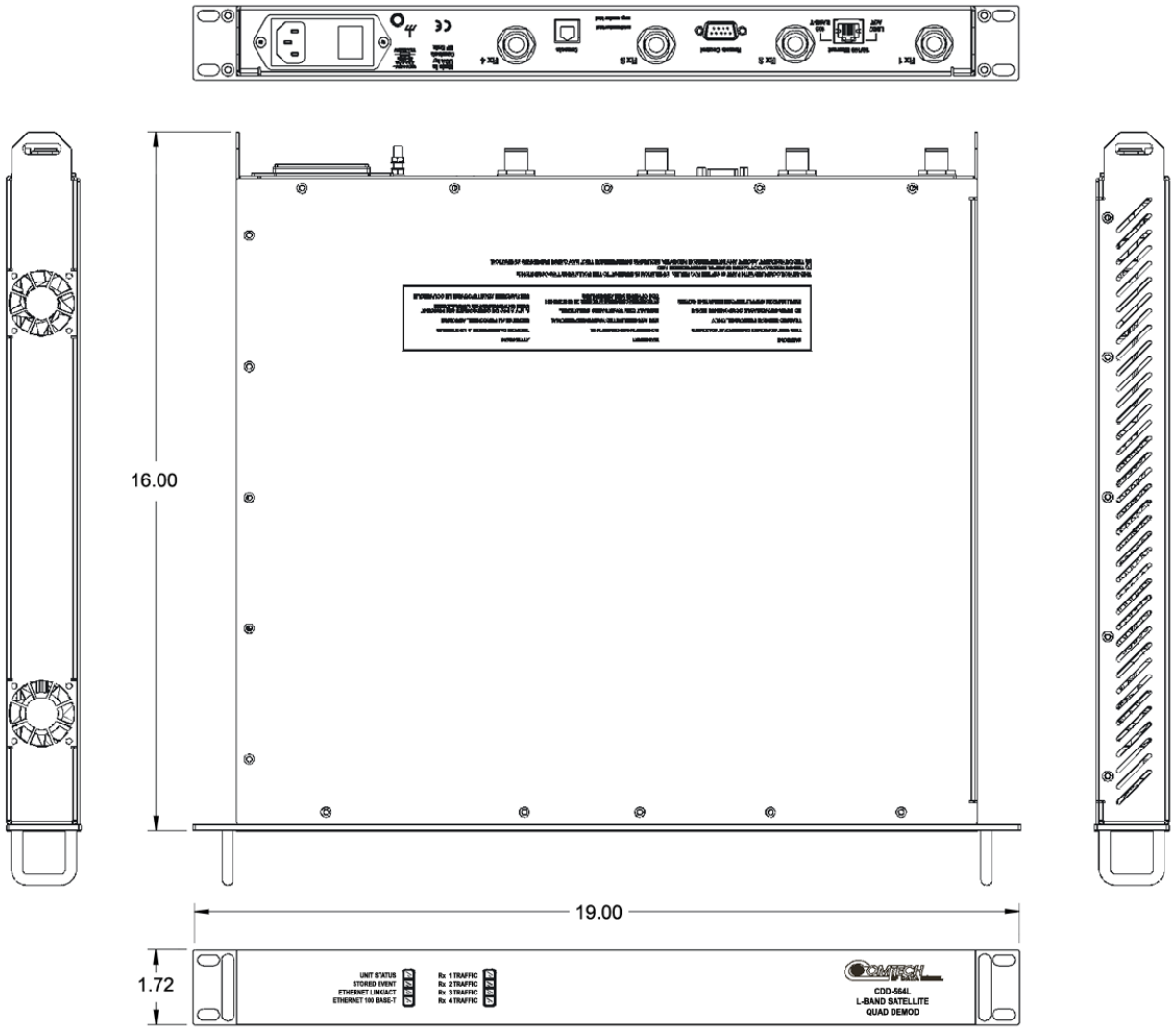


Figure 1-5. CDD-564/564L Dimensional Envelope

1.3.5 Physical Features

1.3.5.1 Front Panel

Figure 1-6. Front Panel Views

Figure 1-6 shows the front panel of the demodulators. Depending on the unit, the front panel features six (CDD-562L) or eight (CDD-564/564L) **L**ight-**E**mitting-**D**iode (LED) indicators.

The LEDs indicate, in a summary fashion, the status of the unit:

- Overall Unit Status
- Stored Event
- Ethernet Link Activity
- Ethernet 10 BaseT or 100BaseT Activity
- Traffic Status for each of the two (CDD-562L) or four (CDD-564/564L) Rx Traffic (receive) channels

1.3.5.2 Rear Panel

CDD-562L

CDD-564

CDD-564L

Figure 1-7. Rear Panel Views

Figure 1-7 shows the rear panels of the demodulators. External cables are attached to connectors on the rear panel of the unit.

Each connector is described in detail in **Chapter 3. REAR PANEL CONNECTOR PINOUTS**. They comprise:

Connector Group (Chapter 3 Sect. Ref.)	Name	Connector Type			Function
		CDD-562L (L-Band)	CDD-564 (70/140 MHz)	CDD-564L (L-Band)	
IF (Sect. 3.2)	Rx 1 *(Rx A on CDD-564L)*	Type 'N' female	BNC female	Type 'N' female	IF Input
	Rx 2 *(Rx B on CDD-564L)*	Type 'N' female	BNC female	Type 'N' female	
	Rx 3 *(Rx C on CDD-564L)*	N/A	BNC female	Type 'N' female	
	Rx 4 *(Rx D on CDD-564L)*	N/A	BNC female	Type 'N' female	
Terrestrial Data (Sect. 3.3)	10/100 Ethernet	RJ-45 female			Ethernet Traffic
	Console	RJ-11 female			Async Serial Console Port
Utility (Sect. 3.4)	Remote Control	9-pin Type 'D' male			Remote Interface (EIA-232) for Factory Test
Power/Ground (Sect 3.5)	AC	See Sect. 3.5.1			Chassis power
	DC (Optional)	See Sect. 3.5.2			
	Ground	#10-32 stud			Common Chassis Ground

NOTE

The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.

1.3.6 Data Interfaces

The demodulators include, as standard, a 10/100 BaseT Ethernet Interface.

1.3.7 Flash Upgrading Demodulator Firmware

The demodulators use 'flash memory' technology internally, and new firmware can be uploaded to the unit from an external PC. This simplifies software upgrading, and updates can be sent via the Internet (from Comtech EF Data's Web server), e-mail, or on CD. The upgrade can be performed without opening the unit, by simply connecting the unit to a 10/100BaseT Ethernet port, then FTPing the download via a PC.

See **Chapter 4. FLASH UPGRADING** for further information.

1.3.8 Fully Accessible System Topology (FAST)

The demodulators are extremely flexible and powerful, and incorporate a large number of optional features. In order to permit a lower initial cost, the demodulator may be purchased with only the desired features enabled.

If, at a later date, a user wishes to upgrade the functionality of a demodulator, Comtech EF Data provides **F**ully **A**ccessible **S**ystem **T**opology (**FAST**), which permits the purchase and installation of options through special authorization codes loaded into the unit, entered remotely via the remote port located on the demodulator rear panel.

These unique access codes may be purchased at any time from Comtech EF Data.

FAST System Theory

FAST facilitates on-location upgrade of the operating feature set without removing a demodulator from the setup.

With **FAST** technology, operators have maximum flexibility for enabling functions as they are required. **FAST** allows an operator to order a demodulator precisely tailored for the initial application.

When service requirements change, the operator can upgrade the topology of the demodulator to meet those requirements within minutes. This accelerated upgrade can be accomplished because of **FAST**'s extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation

Comtech EF Data's **FAST** system is factory-implemented in the demodulator. All **FAST** options are available through the basic platform unit at the time of order – **FAST** allows immediate activation of available options, after confirmation by Comtech EF Data, via the remote control interface.

See **Appendix C. FAST ACTIVATION PROCEDURE** for further information.

FAST Accessible Options

Hardware options for basic demodulators can be ordered and installed either at the factory or in the field. The operator can select options that can be activated easily in the field, depending on the current hardware configuration of the demodulator. A unique access code enables configuration of the available hardware.

As standard features, the demodulator is configured with an Integrated IP router compatible with the optional IP Module/router available in the CDM-570/570L Satellite Modem, and Integrated 2nd Generation Turbo FEC compatible with the CDM-570/570L.

The following table shows the available FAST and FAST-accessible hardware options:

Option	Description and Comments	Option Installation Method
Low-Rate Variable	Data rate 16 kbps to 512 kbps	Base Unit
Mid-Rate Variable	Data rate 16 kbps to 2.048 Mbps	FAST
Full-Rate Variable	Data rate 16 kbps to 5.0 Mbps	FAST
High-Rate Variable	Data rate 16 kbps to 9.98 Mbps	FAST
3xDES Data Encryption	Uses NIST certified 3x core Software Version 1.5.1 and later	FAST
IP Header Compression	Uses proprietary IP Header Compressions Software Version 1.5.1 and later	FAST
Payload Compression	Uses proprietary Payload Compressions Software Version 1.5.1 and later	FAST
8-PSK	8-PSK Modulation	FAST
16-QAM	16-QAM Modulation	FAST
-48 VDC	-48 VDC Prime Power Supply	Hardware
QPSK	Modulation Type	Standard
TPC Codec	Turbo Product Codec (IESS-315 compliant)	Standard
IP Router	10/100 Base-T Interface	Standard

1.4 New in this Release

Firmware revisions incorporate additional features and operational fixes/enhancements. This section documents those improvements. Users are strongly urged to upgrade the CDD-56X to its most current firmware release – for more information, refer to **Chapter 4. FLASH UPGRADING**.

About this Manual Revision

Revision 1 of this manual represents a complete reworking of the manual in its entirety: all content has been re-ordered and updated both to Comtech EF Data Technical Publications Standards and Practices and to incorporate the most current available information on features and operability of the CDD-56X.

Firmware Release Ver. 1.6.0 (6/30/2009)

New Features:

- **VLAN Brouter:** This feature allows VLAN tagged packets to be forwarded when in Router Mode.

1.5 Summary of Specifications

1.5.1 Demodulator

1.5.1.1 70/140 MHz (CDD-564 only)

System Specification		
Frequency Range		50 to 90 or 100 to 180 MHz, 100 Hz resolution
Symbol Rate Range		16 ksps to 3.0 Msps
Data Rate Range		Each demodulator independently in 1 bps increments
Rate 3/4 QPSK TPC		16 kbps to 4.5 Mbps
Rate 7/8 QPSK TPC		16 kbps to 5.25 Mbps
Rate 0.95 QPSK TPC		16 kbps to 5.666Mbps
Rate 3/4 8-PSK TPC		16 kbps to 6.75 Mbps
Rate 7/8 8-PSK TPC		16 kbps to 8.5 Mbps
Rate 0.95 8-PSK TPC		16 kbps to 7.875 Mbps
Rate 3/4 16-QAM TPC		16 kbps to 9.0 Mbps
Rate 7/8 16-QAM TPC		16 kbps to 9.98 Mbps
Descrambling		Comtech to IESS-315
FEC Turbo Product		Rate 3/4, 0.95 QPSK
		Rate 3/4, 0.95 8-PSK
		Rate 3/4, 16-QAM
		Rate 7/8, QPSK, 8-PSK, 16-QAM
Inputs		(4X) Type ‘BNC’ female
Input Impedance		50 or 75Ω user selection
Return Loss		17 dB min
Traffic and Management Interface		10/100 BaseT Ethernet RJ-45
Command Line Interface (CLI)		EIA-232, RJ-11
Factory Test Connector		DB-9 male
Frequency Reference	Internal	± 0.06 ppm, 32 to 122°F (0 to 50°C)
	External	None

Demodulator	
Input Power Range	-30 to –60 dBm
Max Composite Level	+35 dBc, up to –5 dBm
Acquisition Range	± 1 to ± 32 kHz (1 kHz steps) < 625 ksps
Monitor Functions	Eb/No Frequency Offset, BER LNB current and voltage Rx signal level

1.5.1.2 L-Band (CDD-562L, CDD-564L)

System Specification		
Frequency Range		950 to 1950 MHz
Symbol Rate Range		16 ksps to 3.0 Msps
Data Rate Range		Each demodulator independently in 1 bps increments
Rate 3/4 QPSK TPC		16 kbps to 4.5 Mbps
Rate 7/8 QPSK TPC		16 kbps to 5.25 Mbps
Rate 0.95 QPSK TPC		16 kbps to 5.666Mbps
Rate 3/4 8-PSK TPC		16 kbps to 6.75 Mbps
Rate 7/8 8-PSK TPC		16 kbps to 7.875 Mbps
Rate 0.95 8-PSK TPC		16 kbps to 8.5 Mbps
Rate 3/4 16-QAM TPC		16 kbps to 9.0 Mbps
Rate 7/8 16-QAM TPC		16 kbps to 9.98 Mbps
Descrambling		Comtech to IESS-315
FEC Turbo Product		Rate 3/4, 0.95 QPSK
		Rate 3/4, 0.95 8-PSK
		Rate 3/4, 16-QAM
		Rate 7/8, QPSK, 8-PSK, 16-QAM
Inputs		**CDD-562L:** (2X) Type 'N' female **CDD-564L:** (4X) Type 'N' female
Input Impedance		50Ω, 17 dB minimum return loss
Traffic and Management Interface		10/100 BaseT Ethernet RJ-45
Command Line Interface (CLI)		EIA-232, RJ-11
Factory Test Connector		DB-9 male
Frequency Reference	Internal	± 0.06 ppm, 32 to 122°F (0 to 50°C)
	External	None

Demodulator	
Input Power Range	-130 + 10 log (Symbol Rate) to –90 +10 Log (Symbol Rate)
Max Composite Level	+40 dBc, up to –5 dBm
Acquisition Range	± 1 to ± 32 kHz (1 kHz steps) < 625 ksps ± 1 to ± 200 kHz ≥ 625 ksps
Monitor Functions	Eb/No Frequency Offset, BER LNB current and voltage Rx signal level

1.5.2 Low Noise Block Converter (LNB) Support (CDD-564L only)

Parameters	Specifications
LNB Voltage	+13 volts, +18 volts, and +24 volts DC or OFF at 500 mA max per Rx input
10 MHz Reference	-3 dBm ± 3 dB via Rx center conductor
Power Level	Selectable ON or OFF per Rx input

1.5.3 Environmental and Physical

Parameters		Specifications
Temperature	Operating	32 to 122°F (0 to 50°C)
	Storage	-13 to 185°F (-25 to 85°C)
Power Supply		100 to 240 volts AC, 50/60 Hz **Optional:** 48 VDC input (38 to 60)
Power Consumption		75 W typical (140 W max – powering 4 LNBs)
Fuse		120/230 VAC: T3, 15A, slow-blow 20 mm 48VDC (38 to 60 VDC): T8.0A, slow-blow 20 mm
Physical Dimensions		1RU high x 19 inches wide x 16 inches deep (43.8 mm h x 482.6 mm w x 406 mm d)
Weight		7 lbs (3.2 kg)
Agency Approvals		CE Mark FCC Part 15, Class B

1.5.4 Network Protocols

Protocols	
RFC 768 - UDP	RFC 2045 - MIME
RFC 791-IP	RFC 2236 – IGMP v2
RFC 792 – ICMP	RFC 2474 – DS Field
RFC 793 – TCP	RFC 2475 - ADS
RFC 826 - ARP	RFC 2578 - SMI
RFC 856 - Telnet	RFC 2597 – PHB Group
RFC 862 – Ping	RFC 2598 - PHB
RFC 894 – IP	RFC 2616 - HTTP
RFC 959 – FTP	RFC 2821 - SMTP
RFC 1112 – IP Multicast	RFC 3412 - SNMP
RFC 1213 –SNMP MIB II	RFC 3416 – SNMPv2
RFC 1812 – IPv4 Routers	RFC 3418 – SNMP MIB

1.5.5 BER (Bit Error Rate)

IMPORTANT NOTE: Starting with Release 1.4.1 of the CDM-570/570L firmware, the maximum sysmbol rate has been increased from 2.5 to 3.0 Msysmbol/sec. This has been done without modification to the hardware and as a consequence there may be a small degradation in BER versus Eb/No performance for rates above 2.5 Msymbols/sec. The degradation is as follows:

Rates from 2.5 to 2.65 Msps: degradation < 0.1 dB
Rates from 2.65 to 2.80 Msps: degradation < 0.2 dB
Rates from 2.80 to 3.00 Msps: degradation < 0.3 dB

TURBO PRODUCT CODEC Rate 3/4 QPSK Rate 3/4 8-PSK Rate 3/4 16-QAM (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 3/4 (Q) Guaranteed Eb/No: (typical value in parentheses) 3.8dB (3.4dB) 4.1dB (3.7dB) 4.4dB (4.0dB)	Rate 3/4 (8-PSK) Guaranteed Eb/No: (typical value in parentheses) 6.2dB (5.8dB) 6.4dB (6.0dB) 6.8dB (6.3dB)	Rate 3/4 (16-QAM) Guaranteed Eb/No: (typical value in parentheses) 7.4dB (7.0dB) 7.8dB (7.3dB) 8.2dB (7.7dB)
TURBO PRODUCT CODEC Rate 7/8 QPSK Rate 7/8 8-PSK Rate 7/8 16-QAM BER (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 7/8 (Q) Guaranteed Eb/No: (typical value in parentheses) 4.3dB (4.0 dB) 4.4dB (4.1 dB) 4.5dB (4.2 dB)	Rate 7/8 (8-PSK) Guaranteed Eb/No: (typical value in parentheses) 7.0dB (6.6dB) 7.1dB (6.7dB) 7.2dB (6.8dB)	Rate 7/8 (16-QAM) Guaranteed Eb/No: (typical value in parentheses) 8.1dB (7.7dB) 8.2dB (7.8dB) 8.3dB (7.9dB)
TURBO PRODUCT CODEC Rate 0.95 QPSK Rate 0.95 (8-PSK) (With two adjacent carriers, each 7 dB higher than the desired carrier)	For: BER=10^{-6} BER=10^{-7} BER=10^{-8}	Rate 0.95 (Q) Guaranteed Eb/No: (typical value in parentheses) 6.4dB (6.0dB) 6.7dB (6.3dB) 6.9dB (6.5dB)	Rate 0.95 (8-PSK) Guaranteed Eb/No: (typical value in parentheses) 9.3dB (8.9dB) 9.8dB (9.4dB) 10.3dB (9.9dB)	
Monitor Functions	Eb/No estimate, 2 to 16 dB (± 0.25 dB accuracy) Corrected Bit Error Rate, 1E-3 to 1E-9 Frequency offset, ± 200 kHz range, 100 Hz resolution Buffer fill state, in percent Receive signal level (-20 to –90 dBm, accuracy is ± 2.5 dB)			

Chapter 2. INSTALLATION

2.1 Unpacking

The CDD-56X Satellite Demodulator with IP Module and its Installation and Operation Manual are packaged and shipped in a pre-formed, reusable cardboard carton containing foam spacing for maximum shipping protection.

Do not use any cutting tool that extends more than 1" into the container and cause damage to the unit.

Be sure to keep all shipping materials for the carrier's inspection.

Unpack and inspect the demodulator as follows:

Step	Instructions
1	Inspect shipping containers for damage. If shipping containers are damaged, keep them until the contents of the shipment have been carefully inspected and checked for normal operation.
2	Remove the packing list from the outside of the shipping carton.
3	Open the carton by cutting the tape at the top of the carton (indicated by OPEN THIS END).
4	Remove the cardboard/foam space covering the modem. Remove the modem, manual and power cord from the carton.
5	Check the contents against the packing list to verify completeness of the shipment.
6	Inspect the equipment for any possible damage incurred during shipment. If damage is evident, contact the carrier and Comtech EF Data immediately and submit a damage report.
7	Refer to the following sections for further installation instructions.

2.2 Mounting

If the demodulator is to be mounted in a rack, ensure that there is adequate clearance for ventilation, particularly at the sides. In rack systems where there is high heat dissipation, forced air cooling must be provided by top or bottom mounted fans or blowers. Under no circumstance should the highest internal rack temperature be allowed to exceed 50°C (122°F).

IMPORTANT

The demodulator CANNOT have rack slides mounted to the side of the chassis. *Two cooling fans are installed in the right-hand side of the unit. Comtech EF Data therefore recommends that an alternate method of support, such as rack shelves, is employed within the rack. If there is any doubt, please consult the Comtech EF Data Customer Support department.*

2.2.1 Optional Rear-Mounting Support Brackets

As an option, rear-mounting support brackets may be installed using the following kit:

Optional Rear-Mounting Support Bracket Kit (CEFD P/N KT/6228-2)		
Quantity	**Part Number**	**Description**
2	HW/10-32SHLDR	Screw, #10 Shoulder
4	HW/10-32FLT	Washer, #10 Flat
2	HW/10-32SPLIT	Washer, #10 Split
2	HW/10-32HEXNUT	Nut, #10 Hex
2	FP/6138-1	Bracket, Rear Support
4	HW/10-32x1/2RK	Bolt, #10, Rack Bracket

The tools required for this installation are a **medium Phillips™ screwdriver** and a **5/32-inch SAE Allen™ Wrench.** The kit is installed as illustrated in **Figure 2-1** via the following procedure:

Step	Instructions
1	Secure the #10 shoulder screws to the unit chassis through the rear right and left side mounting slots, using the #10 flat washers, #10 split washers, and #10 hex nuts as shown.
2	Install the rear support brackets onto the equipment rack threaded rear mounting rails, using the #10 rack bracket bolts.
3	Mount the unit into the equipment rack, ensuring that the shoulders of the #10 shoulder screws properly engage into the rear support bracket slots.

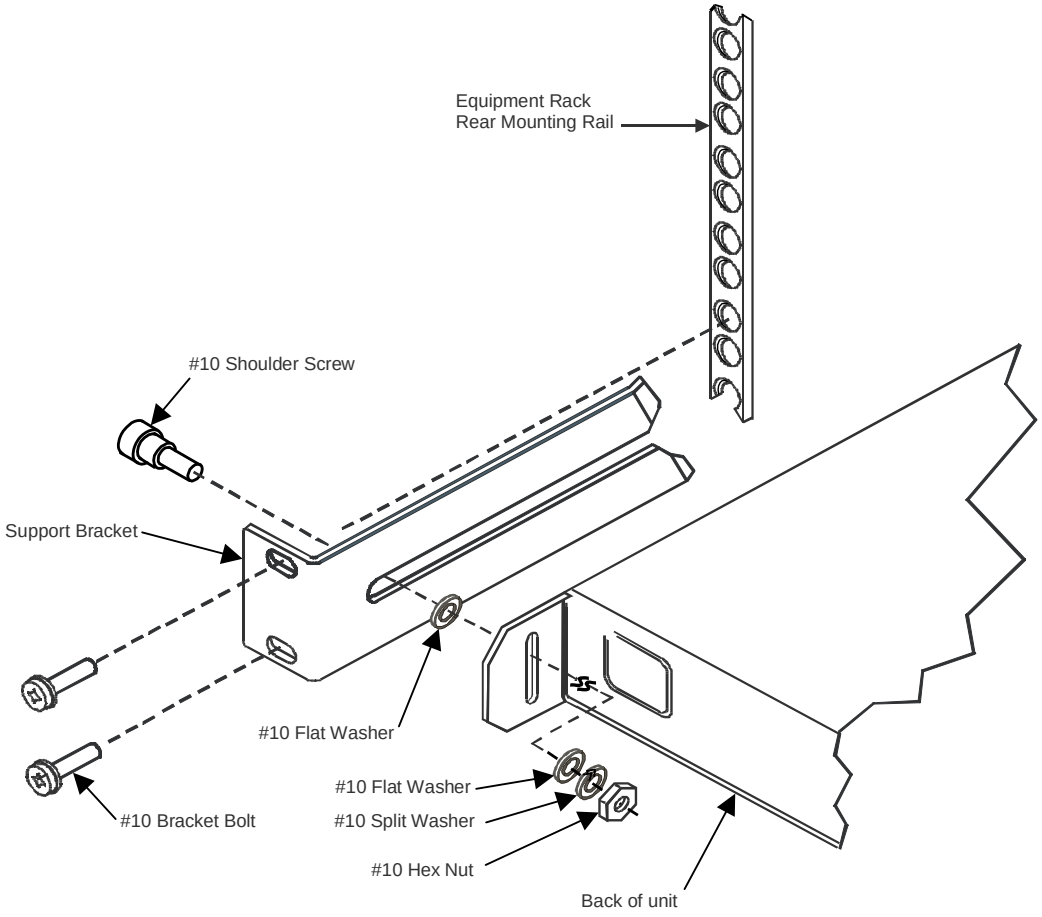


Figure 2-1. Optional Rear-Mounting Support Bracket Kit Installation

2.3 Configuration

There are no internal jumpers to configure, no interface cards to install, and no other options to install: *all configurations are carried out entirely via software*.

The unit will ship with a default 64 kbps, QPSK, Rate 3/4 configuration; the unit should first be further configured locally, using the EIA-232 Console Interface.

Note: The auto-sensing AC power supply does not require any adjustments. Simply plug in the supplied line cord, and turn on the switch on the rear panel.

2.4 Connect External Cables

Having entered the desired configuration, and proceed to connect all external cables to the connectors outlined in the next chapter (**Chapter 3. REAR PANEL CONNECTOR PINOUTS**). Should difficulties occur, contact Comtech EF Data Customer Support for assistance.

Notes:

Chapter 3. REAR PANEL CONNECTOR PINOUTS

3.1 Connector Overview

The CDD-56X Satellite Demodulator rear panel connectors, shown here in **Figure 3-1**, provide all necessary external connections between the demodulator and other equipment. On the next page, **Table 3-1** summarizes the connectors provided on the rear panel interface, grouped according to service function.

CDD-562L

CDD-564

CDD-564L

CDD-56X Chassis w/Optional DC Power

Figure 3-1. CDD-56X Rear Panel Views

Table 3-1. Rear Panel External Connections

Connector Group (Chapter 3 Sect. Ref.)	Name	Connector Type			Function
		CDD-562L (L-Band)	CDD-564 (70/140 MHz)	CDD-564L (L-Band)	
Rx IF (Sect. 3.2)	Rx 1 *(Rx A on CDD-564L)*	Type 'N' female	BNC female	Type 'N' female	RF Input
	Rx 2 *(Rx B on CDD-564L)*	Type 'N' female	BNC female	Type 'N' female	
	Rx 3 *(Rx C on CDD-564L)*	N/A	BNC female	Type 'N' female	
	Rx 4 *(Rx D on CDD-564L)*	N/A	BNC female	Type 'N' female	
Terrestrial Data (Sect. 3.3)	10/100 Ethernet	RJ-45 female			Ethernet Traffic and M&C
Utility (Sect. 3.4)	Remote Control	9-pin Type 'D' male			Remote Interface for Factory Test
	Console	RJ-11 female			Async Serial Console Port
Power/Ground (Sect 3.5)	AC	See Sect. 3.5.1			Chassis power
	DC (Optional)	See Sect. 3.5.2			
	Ground	#10-32 stud			Common Chassis Ground

NOTE

The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.

3.2 Rx IF Connections

CDD-562L/564L: The Rx IF input port connectors on the L-Band demodulators are 50Ω 'N' female types. Two connectors, labeled **Rx1** and **Rx2**, are present on the CDD-562L (shown at left), while four connectors labeled **Rx A** through **Rx D** are provided on the CDD-564L (shown to the right). The return loss on these ports is typically better than 17 dB, and if the user wishes to connect to a 75Ω system, an inexpensive 'N' to 'F' type adapter can be used and is available as an optional accessory. While there will be a reduction in return loss when doing this, the effect in most systems will be imperceptible.

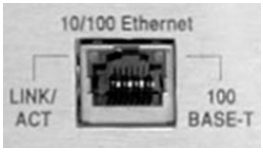
CAUTION

There may be DC voltages present on the Type 'N' Rx IF connectors, up to a maximum of 48 volts.

CDD-564: The Rx IF Input port connectors are BNC female types, with a programmable impedance of 50Ω or 75Ω. Four connectors, labeled **Rx 1** through **Rx 4**, are provided on the CDD-564.

3.3 Terrestrial Data Connection

3.3.1 10/100 BaseT Ethernet Management Port Connector (M&C), RJ-45



The 10/100 Ethernet connector is a standard 8-pin RJ-45 modular jack, used for connecting a UTP cable to an Ethernet switch or hub. This interface is a Network Interface Card (NIC) pinout, used for Ethernet traffic, management of CDD-562L/564/564L IP Module functions via Telnet/HTTP/ SNMP, and upgrading of the demodulator's IP Module software. Observe the following:

Pin #	Function
1	Tx+
2	Tx-
3	Rx+
4	N/C
5	N/C
6	Rx-
7	N/C
8	N/C

3.4 Utility Connections

3.4.1 Remote Control Interface Connector, DB-9M

IMPORTANT

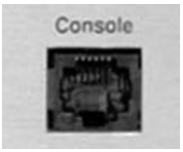
This connector is NOT ***intended for customer use. Contact CEFD Customer Support prior to connecting*** any ***equipment to this interface.***

The Remote Control Interface Connector is a 9-pin Type 'D' male connector.

Note: This interface is **NOT** a standard EIA-232 interface, and it is **NOT** intended for customer use – it is intended for Factory Test use *only*. Observe the following:

Pin #	Description	Direction
1	Ground	--
2	EIA-232 Transmit Data (38.4k, 8N1 fixed)	Out
3	EIA-232 Receive Data (38.4k, 8N1 fixed)	In
4	Selected Demod I-Channel monitor	Out
5	Selected Demod Q-Channel monitor	Out
6	Selected Demod RS-422 Rx Data +	In
7	Selected Demod RS-422 Rx Data -	In
8	Selected Demod RS-422 Tx Clock +	Out
9	Selected Demod RS-422 Tx Clock -	Out

3.4.2 Async-Serial Console, RJ-11



The Async-Serial EIA-232 DCE Console interfaces the IP Module Command Line Interface (CLI) and is used for management of demodulator and IP Module functions using a terminal emulator connected to the Console port via the supplied adapter cable. The Serial Console Connector is a standard 6-pin RJ-11 modular jack. Observe the following:

Pin #	Function
1	Ground
2	Rx
3	Tx
4	Ground
5	Not used
6	Not used

3.5 Power / Ground Connections

3.5.1 Alternating Current (AC) Power Connector (Standard)

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the demodulator. The IEC line input connector contains the ON/OFF switch for the unit. It also is fitted with two fuses, one each for line and neutral connections (or L1, L2, where appropriate). These are contained within the body of the connector, behind a small plastic flap. Observe the following:

AC Power Specifications	
Input Power	40W maximum, 20W typical
Input Voltage	100 - 240 volts AC, +6%/-10% - autosensing (total absolute max. range is 90 - 254 volts AC)
Connector Type	IEC
Fuse Protection	T3.15A Slow-blow (for 120/230 volt AC operation) Line and neutral fusing 20 mm type fuses

IMPORTANT

For continued operator safety, always replace the fuses with the correct type and rating.

3.5.2 Direct Current (DC) Power Connector (Optional)

This optional connector supplies the Direct Current (DC) power to the demodulator. Observe the following:

DC Power Specifications	
Input Power	48 watts (typical) 55 watts (maximum)
Input Voltage	48 volts DC, nominal (36 volts to 60 volts)
Connector Type	Corcom PS series
Mating Connector	Corcom GA210 or Molex 03-12-1026
Fuse Protection	8A Slow-blow Line and neutral fusing 20 mm type fuses (quantity 2)

IMPORTANT

For continued operator safety, always replace the fuses with the correct type and rating.

3.5.3 Ground Connector

A #10-32 stud on the rear panel of the modem is used for connecting a common chassis ground among equipment.

Note: The AC power connector provides the safety ground.

Notes:

Chapter 4. FLASH UPGRADING

4.1 Flash Updating via Internet

The CDD-56X Satellite Demodulator with IP Module eliminates the need for updating firmware by physically replacing EPROMs. Instead, the demodulator uses 'Flash memory' technology internally. This makes software upgrading very simple, and updates can now be sent via the Internet (**Figure 4-1**), via E-mail, or on CD.

This chapter outlines the complete upgrading process as follows:

- New firmware can be downloaded via the Internet to an external PC.
- The upgrade can be performed without opening the demodulator by simply connecting the unit to the Ethernet port of a computer.
- The firmware update is transferred, via File Transfer Protocol (FTP), to the demodulator.

Figure 4-1. Flash Update via Internet

4.2 Ethernet FTP Upload Procedure

1. **Identify** the reflashable product, firmware number, and version for download:

   a. Using the 10/100 Ethernet port, via Telnet and the Command Line Interface (CLI), view the unit information by first typing '**O** <*CR*>' (**Operations and Maintenance** is selected), then by typing 'I <*CR*>' (**Unit Information** is selected).

   For more information on using this interface, refer to **Chapter 7. IP MODULE – CLI AND TELNET OPERATION**.

   b. Using the 10/100 Ethernet port, via HTTP and the IP Module Web server Interface, view the unit information by first clicking the **Maint** (Maintenance) tab, then clicking the **Unit Info** hyperlink.

   For more information on using this interface, refer to **Chapter 8. IP MODULE – WEB SERVER OPERATION**.

2. **Create** a temporary directory (folder) on an external PC.

   Windows: Select **File > New > Folder**, then rename the New Folder to "temp" or another convenient, unused name. Assuming "temp" works, a "*c:\temp*" folder should now be created.

   Note: The **c:** is the drive letter used in this example. Any valid writable drive letter can be used.

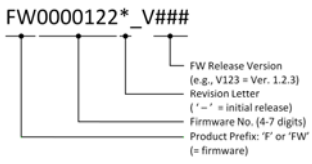
   CMD Prompt: At the command prompt (c:\>), type "**mkdir temp**" or "**MD temp**" without quotes (**mkdir** and **MD** stand for *make directory*). This is the same as creating a new folder from Windows. There should now be a "*c:\temp*" subdirectory created (where **c:** is the drive letter used in the example).

3. **Download** the correct firmware file to this temporary folder.

   As shown in **Figure 4-1**:

   1. **Go online** to: www.comtechefdata.com
   2. **Click on:** ***Support*** tab
   3. **Click on:** ***Software Downloads*** drop-down *or* hyperlink from ***Support*** page
   4. **Click on:** ***Download Flash and Software Update Files*** icon
   5. **Click on:** ***(Select a Product Line) Satellite Modems*** hyperlink
   6. **Select** the ***CDD-562L/564/L*** product hyperlink
   7. **Select** the appropriate firmware hyperlink.

   About Firmware Numbers, File Versions, and Formats: The flashable files on the download server are organized by product prefix; firmware number (verify that the correct firmware number is known – see Step 1); revision letter, if applicable; and release version. The base demodulator bulk firmware for the CDD-56X is **FW0000122*_V###** (where the * asterisk is the revision letter, and ### represents the firmware version).



   The current version firmware release is provided (note that this number, FW0000122, supersedes original firmware number FW/11669). If applicable, a minimum of one version prior to the current release is also available. Be sure to identify and download the desired version. The downloadable files are stored in two formats: *.exe (self-extracting) and *.zip

(compressed). Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.

For additional help with "zipped" file types, refer to *PKZIP for Windows*, *WinZip*, or *ZipCentral* help files. *PKZIP for DOS* is not supported due to file naming conventions.

4. **Unzip** the files in the temporary folder on the PC. At least three files should be extracted (where "X.X.X" is the firmware version):
   - FW0000122x.bin, where "x" is the version (bulk image file).
   - CDD 56x L X.X.X Release Notes.pdf (or a variation of this filename).
   - CDD 56x L X.X.X Upgrade (installation notes).
5. **Connect** the external PC to the demodulator's 10/100 Ethernet port via a hub or a switch, or directly to a PC with a crossover cable.
6. **Send a "ping" command** to the demodulator to verify the communication and connection. Determine the IP address of the demodulator either remotely or by using the front panel:
   - **Using DOS** to PING (and FTP): Click "**Start**" on the Windows toolbar, then select the "**Run...**" option. (Alternatively, use the "**DOS Prompt**" or "**Command Prompt**" icons in the **Start Menu**.)
   - **Using Win95 or Win98:** Type "**command**".
   - **Using WinNT, Win2K or WinXP:** Type "**cmd**".

   Once in DOS, use "**cd c:\temp**" to change to the temporary directory created earlier in Step 2. Use the "**dir**" command to list the downloaded files.
7. **Initiate** an FTP session with the demodulator (the example uses a DOS window):
   a. From the PC, **type** "ftp xxx.xxx.xxx.xxx" where "xxx.xxx.xxx.xxx" is the IP address of the demodulator.
   b. **Enter** your admin user name and password to complete login.
   c. **Verify** the FTP transfer is binary by typing "bin".
   d. **Type** "prompt" then **type** "hash" to facilitate the file transfers.
8. **Transfer** the files.

   Type "put FW0000122*.bin bulk:" to begin the file transfers. The destination "bulk:" must be all lower case. The process sequences through several blocks – this may take several minutes.

   When the upgrade image has been received, the image will be written to flash memory.
9. **Verify** the file transfer.
   a. The PC should report that the file transfer has occurred, and serial console or Telnet can view the status of the upgrade. The FTP login and the file transfer status will be displayed.
   b. Terminate the FTP session by typing "bye" and closing the DOS window.
   c. Verify that the new file loaded, either by Telnet/CLI or Web, using any of the procedures described in Step 1.
10. **Change** the desired image to boot. By default, the demodulator will boot to the version with the *latest date* (**Boot to – Latest**).

    "Boot to" also can be set to force the demodulator to boot up using either Image #1 or Image #2. To do this, select the desired image, then reboot the demodulator via the serial console, Telnet, or Web for the firmware upgrade to become active.

Notes:

Chapter 5. FORWARD ERROR CORRECTION

5.1 Introduction

As standard, the CDD-56X Satellite Demodulator is equipped with an integral Turbo Product Codec. Turbo Coding represents a very significant development in the area of FEC, and Comtech EF Data's Turbo Product Codec offers:

- Rate 3/4 and 0.95 for QPSK and 8-PSK
- Rate 3/4 for 16-QAM
- Rate 7/8 for QPSK, 8-PSK, and 16-QAM

Turbo Product Coding provides the best of class Forward Error Correction technology currently available, along with modulation types that optimize link performance under any conditions.

5.2 Turbo Product Codec

5.2.1 Description

Turbo coding is an FEC technique developed within the last few years that delivers significant performance improvements, when compared to more traditional techniques.

Two general classes of Turbo Codes have been developed: Turbo Convolutional Codes (TCC), and Turbo Product Codes (TPC, a block coding technique). Comtech EF Data has chosen to implement an FEC codec based on TPC.

A Turbo Product Code is a 2 or 3 dimensional array of block codes. Encoding is relatively straightforward, but decoding is a very complex process requiring multiple iterations of processing for maximum performance to be achieved.

Unlike the popular method of concatenating a Reed-Solomon codec with a primary FEC codec, Turbo Product Coding is an entirely standalone method. It does not require the complex interleaving/de-interleaving of the RS approach and, consequently, decoding delays are significantly reduced.

Furthermore, the traditional concatenated RS schemes exhibit a very pronounced threshold effect: A small reduction in Eb/No can result in total loss of demod and decoder synchronization. TPC

does not suffer from this problem; the demod and decoder remain synchronized down to the point where output error rate becomes unusable. This is considered to be an advantageous characteristic in fading environment.

Typically, in QPSK, TPC modes the demod and decoder can remain synchronized ***2 – 3 dB below*** the Viterbi/R-S or TCM cases.

With this release of the demodulator, Comtech EF Data now provides the best Forward Error Correction technology currently available.

5.2.2 End-to-End Processing Delay

In many cases, FEC methods that provide increased coding gain do so at the expense of increased processing delay. However, with TPC, this increase in delay is very modest. **Table 5-1** shows the processing delays for the three TPCs at 64 kbps based on the latency through a CDM-570/570L with IP Module and either a CDD-564/564L or CDD-562L.

Table 5-1. Turbo Product Coding Processing Delay Comparison

FEC Mode (64 kbps data rate)	End-to-end delay, ms
Turbo Product Coding, Rate 3/4	**47**
Turbo Product Coding, Rate 7/8	**249**
Turbo Product Coding, Rate 0.95	**69**

Note that, in all cases, the delay is inversely proportional to data rate, so for 128 kbps, the delay values would be half of those shown above.

5.2.3 Comparison of All TPC Modes (Contains Additional Information)

Mode	Eb/No at BER = 10^{-6} Guaranteed (Typical in parentheses)	Eb/No at BER = 10^{-8} Guaranteed (Typical in parentheses)	Spectral Efficiency	Symbol Rate	Occupied Bandwidth for 1 Mbps Carrier
QPSK Rate 3/4 Turbo	3.8 dB (3.4 dB)	4.4 dB (4.0 dB)	1.50 bits/Hz	0.67 x bit rate	793 kHz
QPSK Rate 0.95 Turbo	6.4 dB (6.0 dB)	6.9 dB (6.5 dB)	1.90 bits/Hz	0.53 x bit rate	626 kHz
*8-PSK Rate 3/4 Turbo	6.2 dB (5.8 dB)	6.8 dB (6.3 dB)	2.25 bits/Hz	0.44 x bit rate	529 kHz
*8-PSK Rate 0.95 Turbo	9.3 dB (8.9 dB)	10.3dB (9.9 dB)	2.85 bits/Hz	0.35 x bit rate	377 kHz
*16-QAM Rate 3/4 Turbo	7.4 dB (7.0 dB)	8.2 dB (7.7 dB)	3.00 bits/Hz	0.33 x bit rate	396 kHz

*Future offering, firmware upgrade and FAST option.

The additional advantages of Turbo – lower delay, performance during fades, etc. – should also be considered.

Table 5-2. Turbo Product Coding Summary

FOR	AGAINST
Exceptionally good BER performance – significant improvement compared with every other FEC method in use today	Nothing!
No pronounced threshold effect – fails gracefully	
Exceptional bandwidth efficiency	
Coding gain independent of data rate (in this implementation)	
Low decoding delay	
Easy field upgrade	

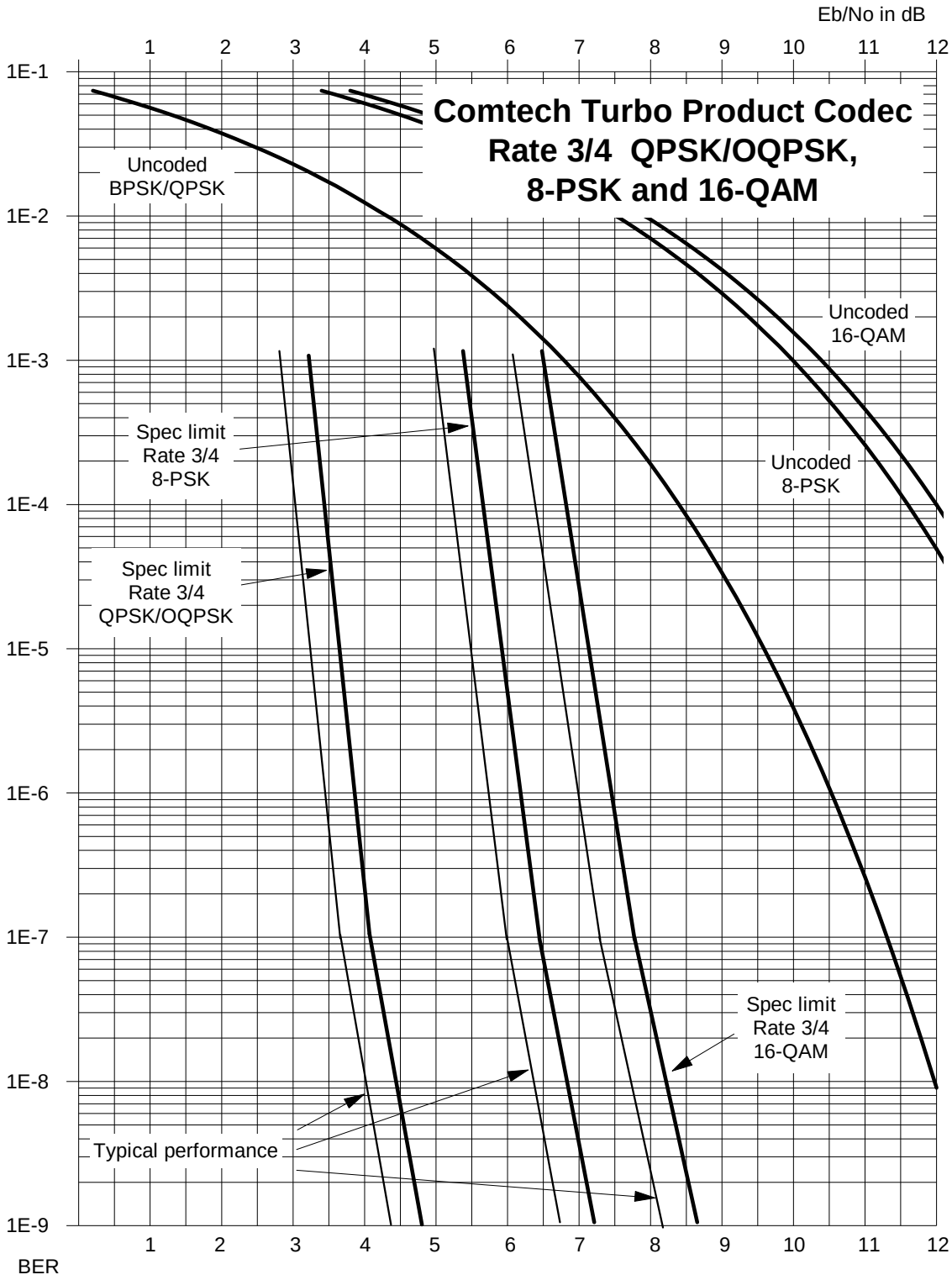


Figure 5-1. Comtech EF Data Turbo Product Codec Rate 3/4 QPSK (OQPSK), 8-PSK, and 16-QAM

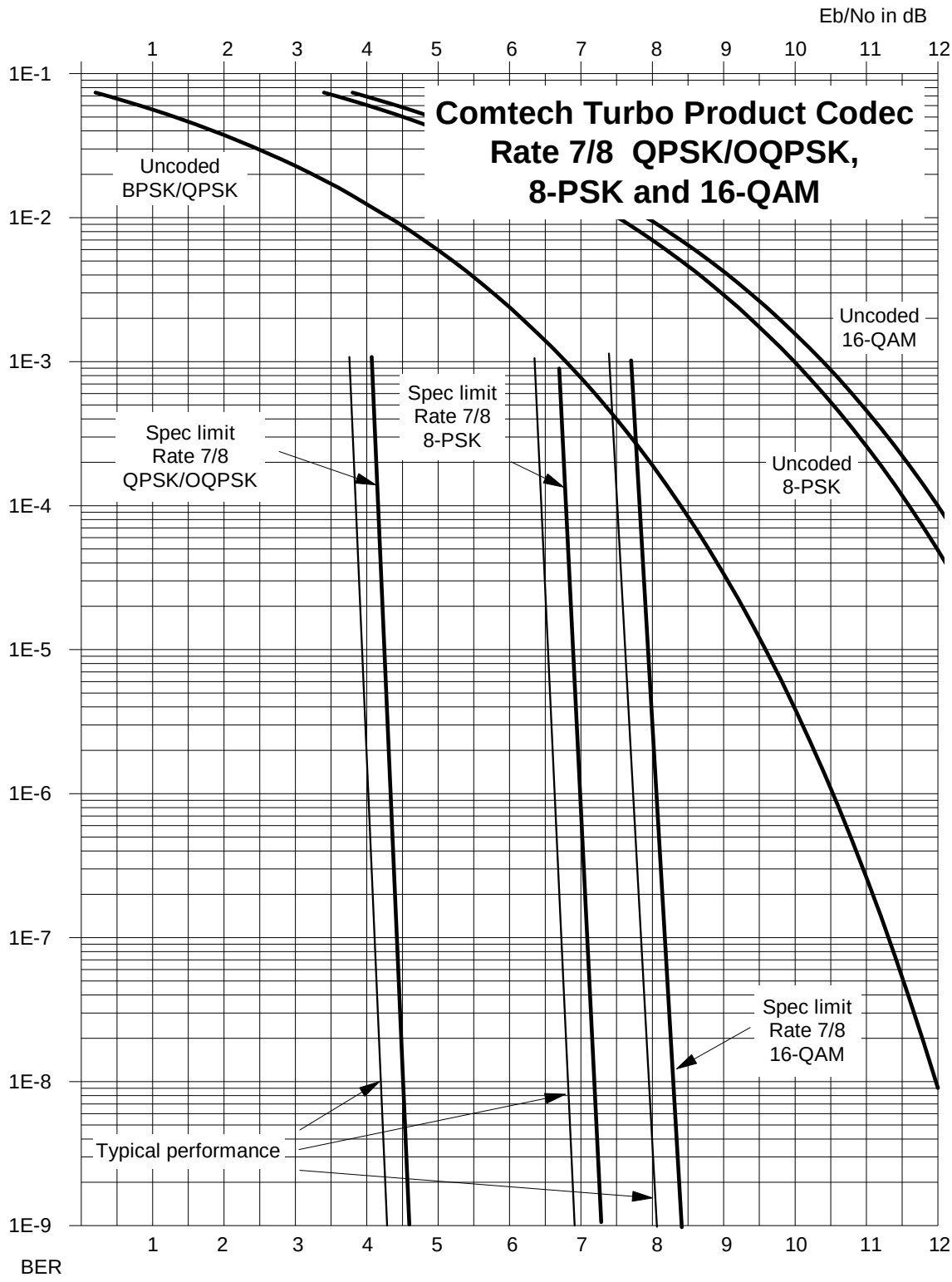


Figure 5-2. Comtech EF Data Turbo Product Codec Rate 7/8 QPSK(OQPSK) , 8-PSK, and 16-QAM

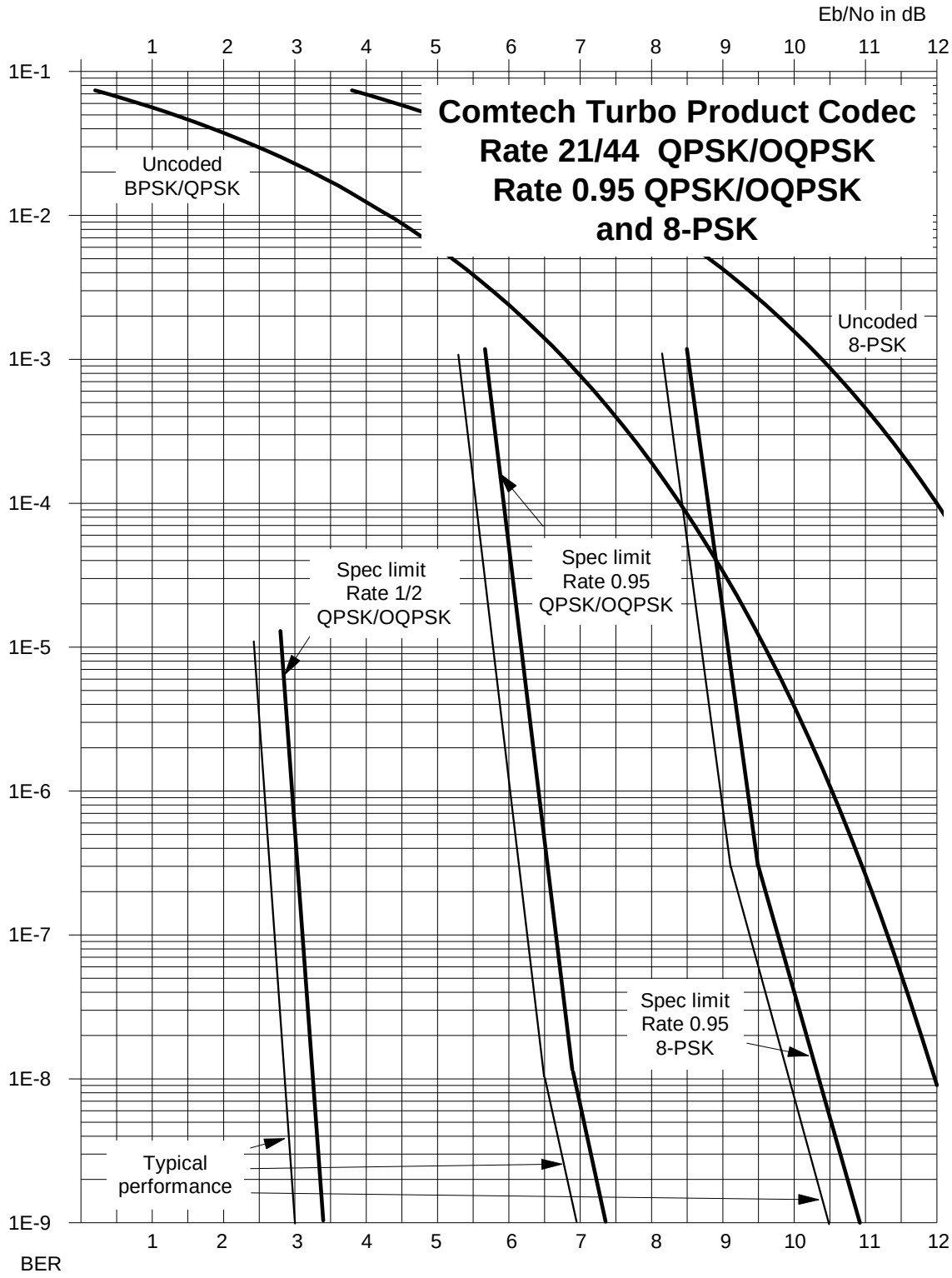


Figure 5-3. Comtech EF Data Turbo Product Codec
Rate 21/44 QPSK, Rate 0.95 QPSK, and Rate 0.95 8-PSK

Chapter 6. IP MODULE ETHERNET INTERFACE OVERVIEW

6.1 Introduction

The CDD-562X Satellite Demodulator's integral IP Module Ethernet Interface is a high-performance, low-cost, IP-centric interface well-suited for closed network **S**ingle **C**hannel **P**er **C**arrier (SCPC) links. It concentrates traffic from two or four independent demodulators into a single Ethernet port, making it ideal for networked VSAT applications. The CDD-56X can also be utilized in a Vipersat satellite bandwidth management sytem.

The following chapters focus on the capabilities and operation of the CDD-56X Demodulator's IP Module. For information specific to CDD-56X IP Module operation when deployed in a Vipersat system, please consult adjunct Comtech EF Data publication **MN/22137 – *Vipersat CDD-56X Series Satellite Network Demodulator Router User Guide***.

6.2 Standard Features

- 10/100BaseT Ethernet Interface (RJ-45)
- Powerful network management:
  - SNMP with public and private MIB
  - Telnet interface for remote product M & C
  - Web Server interface for complete product management
  - Console Port interface for local network management
- Remote software/firmware upgrade via FTP
- Configuration backup and restore via FTP
- Event Logging to capture all IP Module activity
- Detailed Statistics of IP traffic
- IGMP support for Multicast
- Static IP routing for unicast and multicast
- Symmetric and/or asymmetric operation for maximum bandwidth efficiency
- Point-to-Point or Point-to-MultiPoint configuration
- Interoperable with the CDM-570/570L with IP Module, CDM-IP550, and CDM-IP 300L

6.2.1 10/100BaseT Ethernet Interface

In Router Mode operation, the 10/100BaseT Ethernet Interface is used for routing IP traffic received over the satellite to another device on the local LAN, and for monitor and control purposes.

6.2.2 Powerful Network Management

Local or remote management of all demodulator and IP Module functions is available via SNMP, Telnet, or HTTP. The demodulator may be configured, operated and monitored using any of the following methods:

User Interface	Connection	Demod Functions	IP MODULE Functions	Manual Reference
SNMP	Local or remote – Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 7
Telnet	Local or remote – Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 8
Web Server	Local or remote – Ethernet via 10/100 BaseT Traffic interface	ALL	ALL	Chapter 9
Serial Command Line Interface (CLI)	Local – Serial RS-232 via Console Port	ALL	ALL	Chapter 10

6.2.3 Remote Software/Firmware Upgrade via FTP

The demodulator uses 'flash memory' technology internally, and new firmware can be uploaded from an external PC by FTP. This makes software upgrading very simple, and updates can now be sent via the Internet, e-mail, or on CD. The upgrade can be performed without opening the unit or having to be in the same physical location. For further information, refer to **Chapter 4. FLASH UPGRADING.**

6.2.4 Configuration Backup and Restore via FTP

All demodulator configuration parameters are stored in a simple text file. The parameter file can easily be retrieved locally or remotely by FTP. The file can then be used to quickly configure a replacement unit if needed.

6.2.5 Event Logging to Capture All Demodulator Activity

All activity can be stored into an easy-to-read Event Log. This file also can be retrieved locally or remotely by FTP.

6.2.6 Detailed Statistics of IP Traffic

IP traffic statistics are continuously updated and allow detailed performance analysis or can be used to identify traffic problems. The statistics are available through the Serial Console locally, or can be gathered remotely by SNMP, Telnet, or HTTP.

6.2.7 IGMP Support for Multicast

IGMP is a standard feature in the demodulator. If enabled as an IGMP client, it responds to IGMP queries for the configured multicast routes. If enabled as an IGMP server, it generates IGMP queries and transmits multicast traffic per IGMP clients' request. If there are no active IGMP clients on the LAN, it will stop forwarding the multicast traffic (received from the satellite) to the LAN.

6.2.8 Static IP Routing for Unicast and Multicast

Up to 256 static routes can be entered into the demodulator to direct IP traffic to another device on the local LAN.

6.3 Demodulator Features

Enhancing the demodulator performance is easy. Additional features can be added quickly on site, using the FAST access code purchased from Comtech EF Data. To enable these features, obtain and enter the code as outlined in **Appendix X. FAST ACTIVATION PROCEDURE.**

- 3xDES Data Encryption
- IP Header Compression
- Payload Compression

6.3.1 3xDES Encryption with Ability to Change Keys

The demodulator optionally supports 3xDES-128 (using NIST certified 3x core) decryption for the highest-level security. For link encryption, each unit supports eight decryption keys.

6.3.2 IP Header Compression

Header Compression also is an optional feature of the demodulator. The demodulator supports Header Compression for the following Ethernet and Layer 3 & 4 Headers:

Supported Ethernet Headers
Ethernet 2.0
Ethernet 2.0 + VLAN-tag
Ethernet 2.0 + MPLS
802.3-raw
802.3-raw + VLAN-tag
802.3 + 802.2
802.3 + 802.2 + VLAN-tag
802.3 + 802.2 + SNAP
802.3 + 802.2 + SNAP + VLAN-tag
802.3 + 802.2 + SNAP + MPLS
Supported Layer 3&4 Headers
IP
TCP
UDP
RTP (Codec Independent)

Header Compression reduces the required VoIP bandwidth by 60 percent. Example: A G.729a voice codec, operating at 8 kbps, will occupy 32 kbps once encapsulated into IP framing on a LAN. Using IP/UDP/RTP Header Compression, the same traffic only needs 10.8 kbps total WAN satellite bandwidth to cross the link. A total maximum of 64 simultaneous VoIP calls can be compressed. Normal Web/HTTP traffic can be reduced an additional 10% via IP/TCP header compression.

Header Compression Configuration – Header Compression is completely independent from QoS, and there is no configuration required except enabling the Header Compression feature on both the sending and receiving Comtech EF Data IP modem/demod. Packets with a Header Compression supported header will automatically be identified for compression. The only configuration consideration is the Header Compression Refresh Rate. This is how many compressed header packets will be sent before a single full header packet is sent. Sometimes compressed header traffic could be lost during deteriorated satellite link conditions. Sending a full header packet will allow the return of the traffic stream. The Refresh Rate can be increased for poor satellite link conditions or decreased to further reduce overhead.

6.3.3 Payload Compression

Traffic optimization through Payload Compression is another optional feature of the demodulator.

- FAST feature to upgrade
- Uses AHA© chip
- Compression algorithm applied to all data (HDLC header excluded).
- Compression statistics are fed back to QoS in order to maximize WAN utilization while maintaining priority, jitter and latency.
- 1024 simultaneous compression sessions to maximize compression across multiple distinct traffic flows.
- Compression algorithm not applied to RTP streams because this traffic is already compressed and would only INCREASE the satellite bandwidth if compressed again.
- Additional statistics have been added to the compression statistics menu in order to provide feedback on the compression efficiency that has been achieved.
- Payload Compression is selectable on a per route basis.

6.3.3.1 ADLC vs LZS Compression Comparison

These numbers have been generated using an internally created test program. This program takes the target benchmark files and splits the files into payload size chunks and compresses each chunk in a separate invocation of the compression algorithm. This is important to note because most compression algorithms are applied to the entire file data set as a single invocation of the compression algorithm, which is easier for other types of compression algorithms (LZS, GZIP in specific). This, of course, does not apply to streamed packet data across an IP network (e.g., FTP transfer).

Algorithm	Payload size	File Set	Ratio
ADLC	1472	Calgary	1.76
ADLC	1000	Calgary	1.76
ADLC	500	Calgary	1.77
ADLC	100	Calgary	2.09
ADLC	1472	Canterbury	1.71
ADLC	1000	Canterbury	1.72
ADLC	500	Canterbury	1.74
ADLC	100	Canterbury	2.04
LZS	1472	Calgary	1.66
LZS	1000	Calgary	1.66
LZS	500	Calgary	1.68
LZS	100	Calgary	1.97
LZS	1472	Canterbury	1.61
LZS	1000	Canterbury	1.62
LZS	500	Canterbury	1.63
LZS	100	Canterbury	1.91

6.4 IP Module Specifications

6.4.1 Supported RFCs and Protocols

RFC	Protocol
RFC 768 User Datagram Protocol	RFC 791 Internet Protocol
RFC 792 Internet Control Message Protocol	RFC 793 Transmission Control Protocol
RFC 826 An Ethernet Address Resolution Protocol	RFC 856 Telnet Binary Transmission
RFC 862 Echo Protocol	RFC 894 A Standard for the Transmission of IP Datagrams over Ethernet Networks
RFC 959 File Transfer Protocol	RFC 1112 Host Extensions for IP Multicasting
RFC 1213 Management Information Base for Network Management of TCP/IP-based internet: MIB-II	RFC 1812 Requirements for IP Version 4 Routers
RFC 2045 Multipurpose Internet Mail Extensions (MIME)	RFC 2236 Internet Group Management Protocol, Version 2
RFC 2474 Definition of the Differentiated Services Field (DS Field) in the Ipv4 and Ipv6 Headers	RFC 2475 An Architecture for Differentiated Services
RFC 2578 Structure of Management Information Version 2 (SMIv2)	RFC 2597 Assured Forwarding PHB Group
RFC 2598 An Expedited Forwarding PHB	RFC 2616 Hypertext Transfer Protocol – HTTP/1.1
RFC 2821 Simple Mail Transfer Protocol	RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3416 Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)	RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)

6.4.2 CDD562L/564/564L Compatibility

The CDD-56X is compatible with other Comtech EF Data IP modems (referred to hereafter as CDM-IP), provided the modems have similar operating modes and IP options.

The following is a list of compatible CDM-IP modems:

CDD-564L IP FW Version	Comtech EF Data IP Modem / IP FW Version	Comments
Version 1.1.0 or later	CDM-IP 550 Version 1.3.0 or later	Must have Framer II Module (PL/9956-1) to support Data Compression IP option
Version 1.1.0 or later	CDM-IP 300L Version 1.3.0 or later	Must have Framer II Module (PL/9956-1) to support Data Compression IP option
Version 1.1.0 or later	CDM-570/570L Version 1.4.0 or later	

6.5 Typical IP Module Operational Setups

The CDD-56X has several modes of operation. This section provides typical setup examples for the unit as a means to determine the best mode of operation for the appropriate network topology and Ethernet traffic environment.

6.5.1 IP Module Working Modes

Typical CDM-IP modems support two Working Modes: easyConnect™ and Router Mode; **however, the demodulator only supports Router Mode, so the CDM-IP modem that is transmitting to demodulator must be in Router Mode.** Non-IP traffic is not supported in Router Mode.

Router Mode supports three HDLC Addressing Modes: Point-to-Point, Small Network, and Large Network. Separate HDLC Modes allow the user to minimize the HDLC overhead transmitted over the satellite based on the size of their network.

In Router/Point-to-Point Mode, no HDLC address is transmitted, Router/Small Network transmits 1 byte, and Router/Large Network transmits 2 bytes as part of HDLC header for each packet.

In the sections that follow, the functionality of these modes is described in further detail, in order to optimize the Comtech EF Data IP modems in the network, based upon Network Topology and Ethernet Traffic requirements.

IMPORTANT

1. ***The demodulator only supports Router Mode, so the CDM-IP modem that is transmitting to demodulator must be in Router Mode.***
2. ***The HDLC Address Mode of the Comtech EF Data IP modems must be identical to pass traffic between the TX modems and the demodulator.***
3. ***Changing the HDLC Address Mode of the demodulator requires the IP Module to be rebooted. Before the user can select a different mode, the demodulator will notify the user that changing the mode will require a reboot.***

Working Mode HDLC Address Mode	Network Topology	Ethernet Traffic
Router Mode Point-to-Point	Point-to-Point only Both sites on different LAN subnet	IP v4 only
Router Mode Small Network	Point-to-Point or Point-to-MultiPoint (up to 254 sites) All sites on different LAN subnet	IP v4 only
Router Mode Large Network	Point-to-Point or Point-to-MultiPoint (up to 32766 sites) All sites on different LAN subnet	IP v4 only

Feature Support - The demodulator also has several standard and optional features to further optimize security, performance and efficiency.

The following table defines how these features are supported:

Standard Features	Additional Notes
HDLC Address Mode	Point-to-Point, Small Network, or Large Network
Access Lists	4 Clients by IP or IP Subnet
Multicast	RX all or specific Multicast streams
IGMP	IGMPv1, IGMPv2
Upgrade by FTP	By local LAN or remotely through satellite (requires a two way connection to demodulator)
* Quality of Service	Min/Max, Max/Priority, or DiffServ
Optional Features	**Additional Notes**
Header Compression	Must be enabled if any TX modem stream has Header Compression enabled.
Payload Compression	Must be enabled if any TX modem stream has Payload Compression enabled.
3xDES Encryption	Must be enabled if any TX modem stream has 3xDES Encryption enabled. Up to 8 Decrypt Keys or random

* Quality of Service (QoS) processing is performed by the transmit end of the link and passed through the IP Module in the demodulator. Support for QoS is a standard feature in the demodulator.

6.5.1.1 Router Working Mode – Point-to-Point

Figure 6-1 shows an example setup using the CDD-562L L-Band Satellite Dual Demodulator at a Hub site to receive two separate DVB return channels. Observe the following:

- The CDD-562L and all CDM-IP modems are in **Point-to-Point Mode**.
- Each remote site has a CDM-IP modem with a default static route.
- The CDD-562L has a default static route directing traffic to the hub router.
- The hub router would have routes defined for each remote network that would be directed to the DVB Encapsulator.

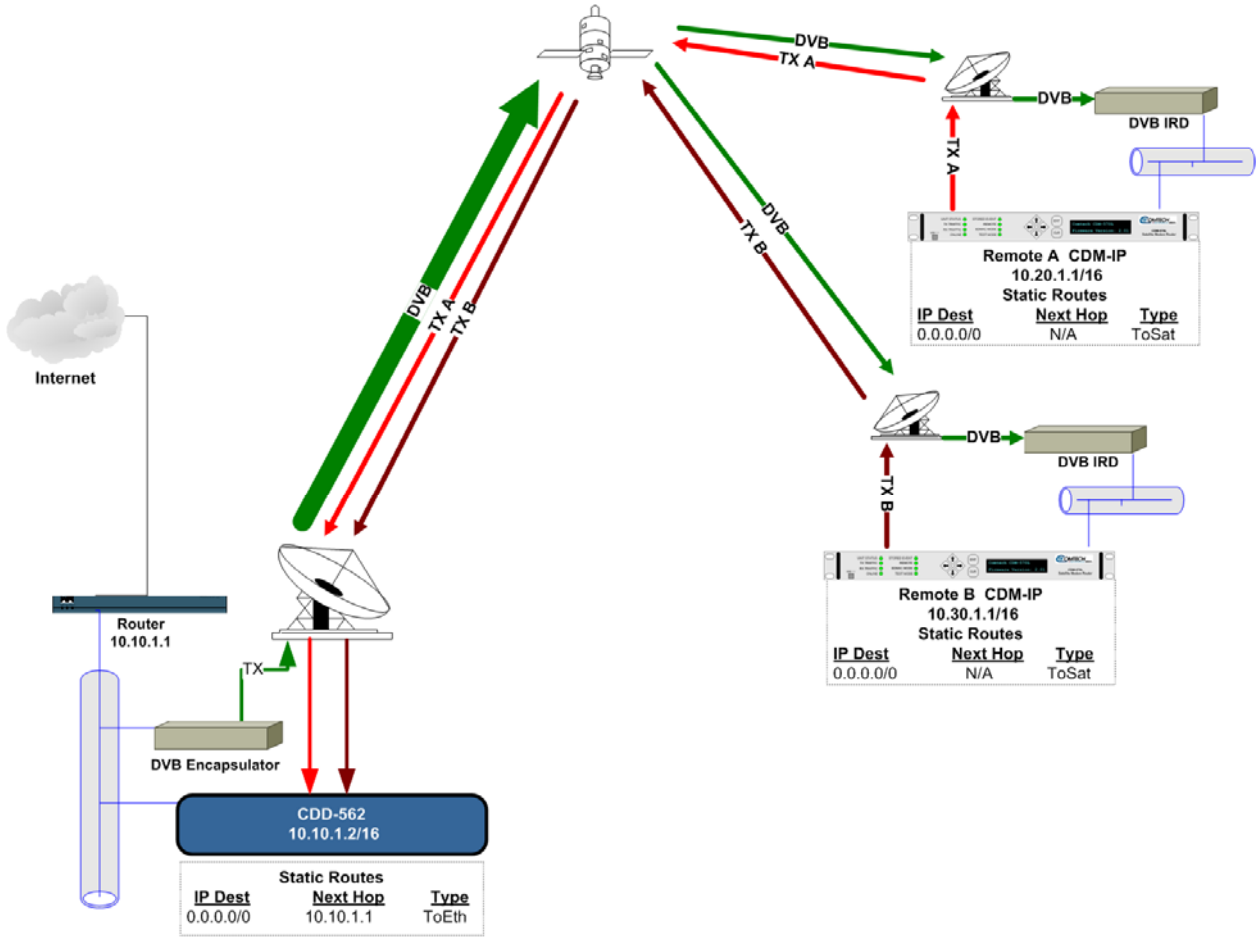


Figure 6-1. (CDD-562L) Router Mode Point-to-Point Diagram

Figure 6-2 shows an example setup using the CDD-564 (70/140 MHz) or CDD-564L (L-Band) Satellite Quad Demodulator at a Hub site to receive three separate DVB return channels. Observe the following:

- The demodulator and all CDM-IP modems are in **Point-to-Point Mode**.
- Each remote site has a CDM-IP modem with a default static route.
- The demodulator has a default static route directing traffic to the hub router.
- The hub router would have routes defined for each remote network that would be directed to the DVB Encapsulator.

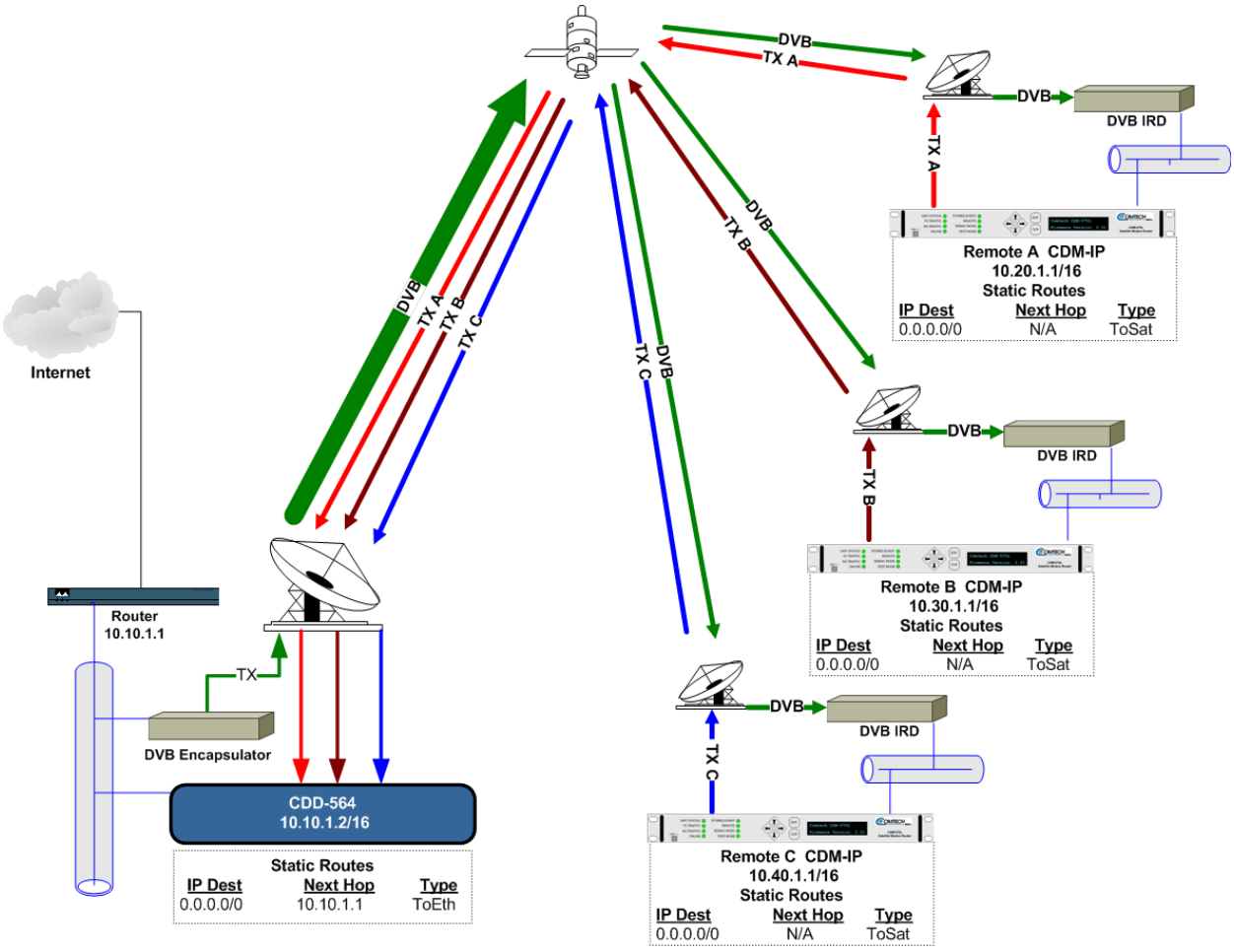


Figure 6-2. (CDD-564/564L) Point-to-Point Router Working Mode Diagram

6.5.1.2 Router Working Mode – Point-to-MultiPoint

Figure 6-3 shows a **"Star Network" Point-to-MultiPoint Configuration**, where the Hub CDM-IP modem is transmitting a common STDMA carrier to two remote sites with CDM-IP modems. In turn, the Remote CDM-IP is transmitting a link back to the Hub that is received by the CDD-562L L-Band Satellite Dual Demodulator.

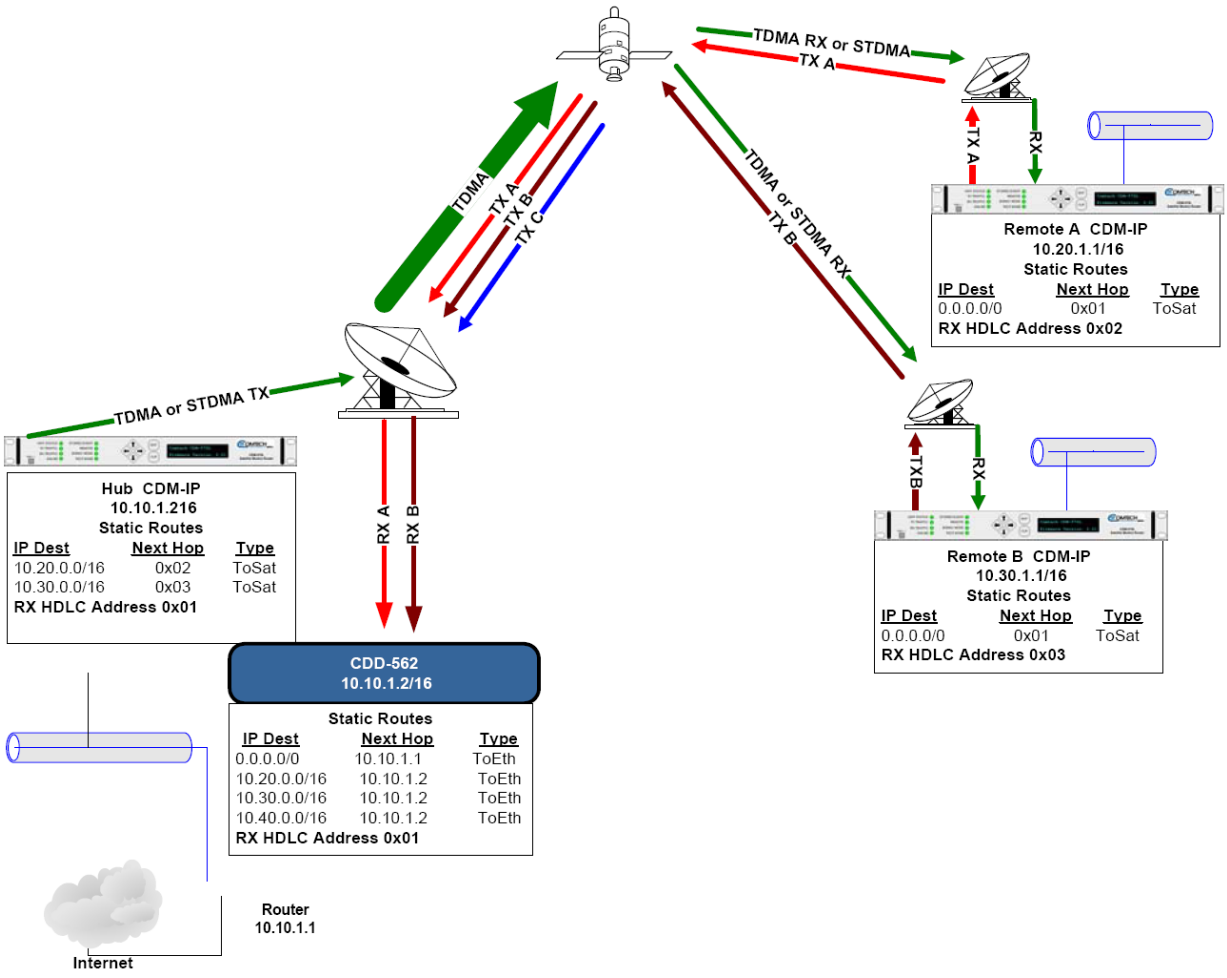


Figure 6-3. (CDD-562L) Point-to-MultiPoint Router Working Mode Diagram

Figure 6-4 shows a **"Star Network" Point-to-MultiPoint Configuration** where the Hub CDM-IP modem is transmitting a common STDMA carrier to three remote sites with CDM-IP modems. In turn, the Remote CDM-IP is transmitting a link back to the Hub that is received by the CDD-564 (70/140 MHz) or CDD-564L (L-Band) Satellite Quad Demodulator.

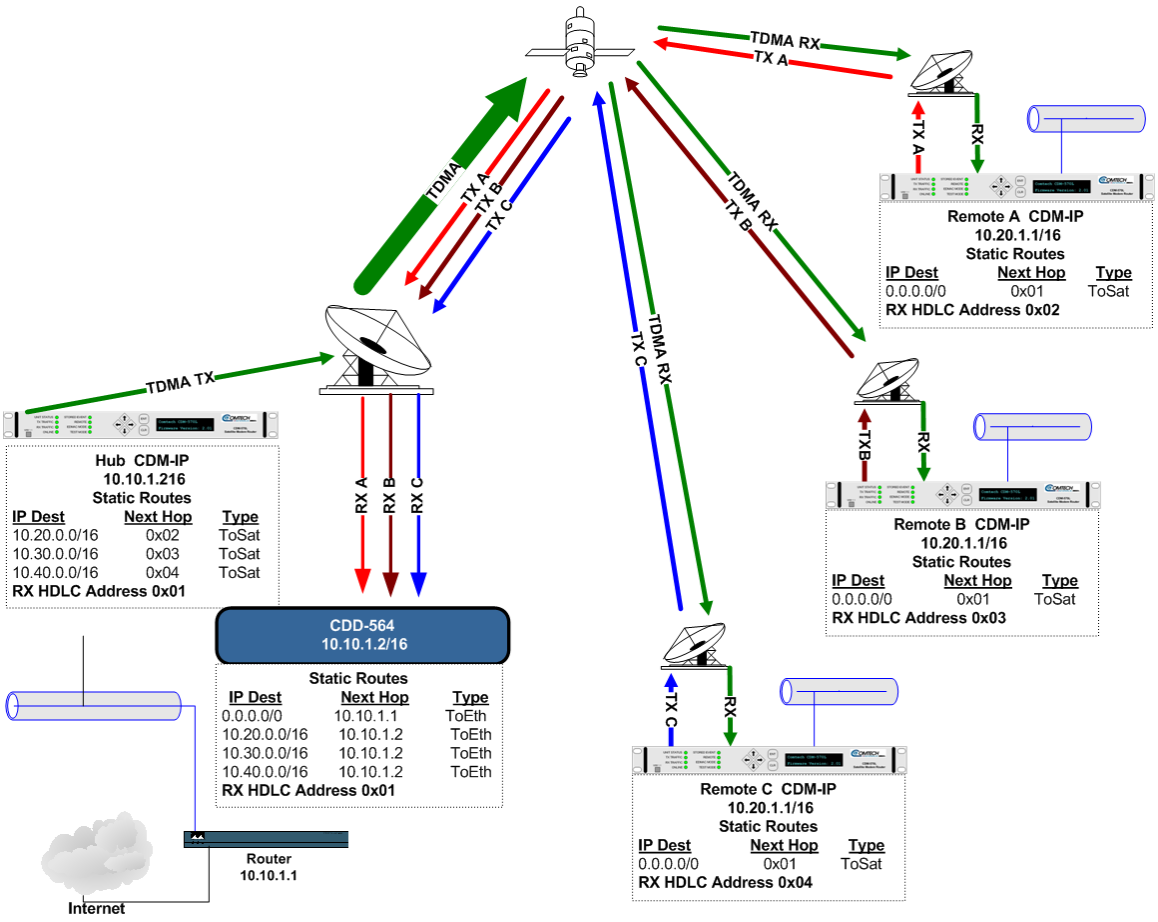


Figure 6-4. (CDD-564/564L) Point-to-MultiPoint Router Working Mode Diagram

Since this is a Point-to-MultiPoint configuration, HDLC addressing is used so that the traffic not intended for a particular destination can be filtered (Small or Large HDLC Mode). For unicast traffic, it is best to associate a unique HDLC address for each site in the network; in this case, the Hub Site is HDLC 0x01; Remote A is HDLC 0x02; Remote B is 0x03; and (CDD-564/564L) Remote C is 0x04.

Each CDM-IP modem would select the HDLC address associated with its site as an Rx HDLC Address, so both CDM-IP modem and the CDD-564L at the Hub would have 0x01 as the first RX HDLC Address. Remote A CDM-IP would have 0x02, and B would have 0x03, and (CDD-564/564L) C would have 0x04.

The remote CDM-IP modems only need a single default route to is directed to the Hub HDLC, 0x01. All of the traffic is managed by the static route entries in the hub CDM-IP and demodulator. The demodulator has a default route to the router for Internet access. It also has specific routes for the remote networks which are directed to the Hub CDM-IP. The Hub CDM-IP also has specific routes for the remote networks with the HDLC address associated with each site.

Notes:

Chapter 7. ETHERNET MANAGEMENT

7.1 Introduction

The CDD-56X Satellite Demodulator with IP Module is equipped with an RJ-45 10/100BaseT Ethernet management interface, used for monitor and control purposes. This chapter provides a high-level overview of the functionality provided by this interface, and references other chapters where relevant to the operation of this interface.

7.2 Ethernet Management Interface Protocols

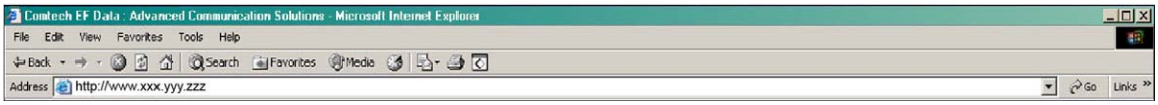
The modem 10/100 Base-T Ethernet Management Interface supports three (3) different management protocols:

- Web Server (HTTP) interface for complete product management
- SNMP with public and private MIB
- Telnet interface for remote product M&C

7.3 Web Server (HTTP) Interface

The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the demodulator. These pages have been designed for optimal performance when using Microsoft's Internet Explorer 5.5 or higher (the browser examples shown below use Microsoft Internet Explorer 6.0)..

The Web Server Interface is accessible using a Web browser by typing "*http://www.xxx.yyy.zzz*" in the browser's **Address** box, where "*www.xxx.yyy.zzz*" is the IP address of the demodulator:


Comtech EF Data : Advanced Communication Solutions - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://www.xxx.yyy.zzz
Go Links

Once a valid IP address is entered, the user is prompted to type in a valid User Name and Password, similar to the dialogue box shown to the right (the site IP address shown in this example is for display purposes only. Contact your network administrator to determine the appropriate IP address assignment for your unit).

Observe the following:

Typical HTTP Login Access Levels, User Names, and Passwords are defined as follows:

User Interface	User Login Access Level		
	Admin User	Read/Write User	Read Only User
Web	Full Access to all Web Pages	No Access to Admin pages	No Access to Admin pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages

CDD-56X Demodulator Web Server Default Name/Passwords		
Admin User	**Read/Write User**	**Read Only User**
comtech/comtech	opcenter/1234	monitor/1234

Type the appropriate User Name and Password, then click **OK** to complete login. For further details on using the Web Server Interface, refer to **Chapter 8. WEB SERVER INTERFACE**.

7.4 SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an application-layer protocol designed to facilitate the exchange of management information between network devices. The demodulator SNMP agent supports both SNMPv1 and v2c.

IMPORTANT

For proper SNMP operation, the demodulator MIB files must be used with the associated version of the demodulator firmware. Please refer to the CDD-562L/564/564L FW Release Notes for information on the required FW/SW compatibility.

7.4.1 Management Information Base (MIB) Files

MIB files are used for SNMP remote management and consist of Object Identifiers (OIDs). Each OID is a node that provides remote management of a particular function. An MIB file is a tree of nodes that is unique to a particular device.

There are three MIB files are associated with the CDD-56X Demodulator:

MIB File/Name	Description
FW11669-2-.mib ComtechEFData MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: Name: comtechEFData OID: 1.3.6.1.4.1.6247 Path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247)
FW11669-3D.mib MIB file	CDD-564 MIB file consists of all of the OID's for management of the demodulators functions.
FW11669-4-.mib Traps MIB file	CDD-564 Traps MIB file is provided for SNMPv1 traps.

These MIB files should be compiled in a MIB Browser or SNMP Network Monitoring System server.

Note: The SNMP agent supports both **SNMPv1** and **v2c**. The **Traps** file needs to be compiled only if **SNMPv1** traps are to be used.

IMPORTANT

Any changes made to the IP Parameters will be lost if the demodulator is reset or loses power unless the changes are saved to permanent storage. The IP Parameters can be saved by a SET of the* cdd564SaveParamToFlash *OID within the MIB.

7.4.2 SNMP Community Strings

The modem uses community strings as a password scheme that provides authentication before gaining access to the modem agent's MIBs.

In "**SNMP v1/v2c"**, the community string is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The community string is entered into the MIB Browser or Network Node Management software and is used to authenticate users and determine access privileges to the SNMP agent.

The user defines three Community Strings for SNMP access:

- Read Community default = public
- Write Community default = private
- Trap Community default = comtech

Note: Maximum number of characters for community strings shall not exceed 20. All printable ASCII characters, except '\' and '~' are allowed. No trailing spaces are permitted for community strings.

7.4.3 SNMP Traps

The demodulator has the ability to send out SNMP traps when certain events occur in the unit. For example, when the demodulator boots it sends out a coldstart trap and a linkup trap for each interface that is brought up. The demodulator also sends out traps when an alarm or a fault occurs in the unit. These include Unit faults, Rx faults, and LNB faults. A trap is sent both when a fault occurs and is cleared.

The demodulator supports both SNMPv1 traps and SNMPv2 notifications. Which style of traps the CDM-570/570L sends can be configured by the user using the cdd564SNMPTrapVersion OID.

The following are the MIB-II v1traps/v2 notifications that the modem supports:

MIB-II SNMPv1 traps:

Cold Start	1
Link Up	4
Authentication Failure	5

MIB-II SNMPv2 notifications:

Cold Start	1.3.6.1.6.3.1.1.5.1
Link Up	1.3.6.1.6.3.1.1.5.4
Authentication Failure	1.3.6.1.6.3.1.1.5.5

The following tables are the Alarms and Faults v1 traps / v2 notifications that the modem supports.

Alarms and Faults SNMPv1 traps:

cdd564UnitAlarmTrap	6247251
cdd564RxAlarmTrap	6247252
cdd564LNBAlarmTrap	6247253

Alarms and Faults SNMPv2 notifications:

cdd564UnitAlarmNotification	1.3.6.1.4.1.6247.24.2.0.1
cdd564RxAlarmNotification	1.3.6.1.4.1.6247.24.2.0.2
cdd564LNBAlarmNotification	1.3.6.1.4.1.6247.24.2.0.3

7.4.4 MIB-II

The demodulator agent implements RFC 1213, Management Information Base for Network Management of TCP/IP-based Internets. This is known as "MIB-II" or "Public MIB support."

For detailed OID information please refer to the actual MIB file. The agent implements the following Groups:

Table 7-1. MIB-II Support

Group	Comments
System Group	Mandatory for RFC1213
Interface	Mandatory for RFC1213
IP	Mandatory for RFC1213
ICMP	Mandatory for RFC1213
TCP	Mandatory for RFC1213
UDP	Mandatory for RFC1213
SNMP	Mandatory for RFC1213
Address Translation Group	Implemented but depreciated in MIB-II
EGP	Not applicable

7.4.5 Private MIB

The Private MIB holds all the security, feature selection, IP related parameters and all the demodulator specific parameters. For detailed OID information please refer to the actual MIB file.

7.4.5.1 Administration Group

This group contains system security, administration, and feature configuration parameters.

7.4.5.1.1 Access Lists Subgroup

This subgroup allows the user to define which remote clients can connect to a demodulator when the Access List Enforcement is enabled. Each entry allows the user to specify an IP address and a subnet mask to define a unique class of clients that are allowed access to the unit.

7.4.5.1.2 Features Subgroup

This subgroup allows the user to enable/disable a Standard or FAST feature.

Standard features (ping reply, telnet, , IGMP, and multicast forwarding) can be enabled or disabled by sending a 1 (enable) or 0 (disable).

Header decompression can be enabled or disabled on a per demodulator basis via the FeaturesTable.

Changing the Working mode between Point-to-Point Mode, Small Network Mode, Large Network Mode, and Vipersat Mode forces the system to reboot. System configuration will be saved before re-booting. Please make sure you are setting the correct value.

7.4.5.1.3 3xDES Decryption Subgroup

This subgroup controls the parameters for the triple DES (3xDES) feature. Each Receive key is of 192-bit length. The Rx DES keys can be entered through the DESRxKeyTable.

7.4.5.1.4 SMTP Subgroup

This subgroup sets up the unit to use a SMTP mail server to send a problem report back to Comtech EF Data Modem Support. Along with the problem report, the unit sends the equipment serial number and configuration, which is attached to the email message. By default, the problem report is sent to: cdmipsupport@comtechefdata.com.

In order for this to work, the user is required to enter the IP address of their outgoing SMTP mail server. Also the user should enter their email username (text before the @ in an email address) and email domain name (text after the @ in an email address).

7.4.5.1.5 SNMP Traps Subgroup

This subgroup controls where SNMP traps are sent and the community string used in sending traps. Either SNMPv1 or SNMPv2 traps can be sent.

7.4.5.2 Interface Group

This group controls the parameters of the unit's Ethernet and demodulator interfaces.

7.4.5.2.1 Ethernet Interface Subgroup

This subgroup defines the unit's Ethernet interface. These include parameters for setting the Ethernet speed, IP address, and IP address subnet prefix length.

7.4.5.2.2 Demodulator Interface Subgroup

This subgroup defines the Demodulator's interfaces each demodulator's HDLC addresses.

HDLC Address Mode has been changed to be read-only. This parameter is now settable through the Working Mode OID (cdd564WorkingMode) in the Features subgroup.

7.4.5.3 Route Table Group

This group allows the user to define how the packets that the unit receives are routed.

7.4.5.4 Protocols Group

These protocols groups allow the user to control networking protocols such as IGMP.

7.4.5.4.1 IGMP Subgroup

This subgroup controls the IGMP, Internet Group Management Protocol, which is the standard for IP multicasting in the Internet.

7.4.5.5 Maintenance Group

This group contains several miscellaneous operations for the demodulator, including the unit information, bulk database configuration (allows the user to define which image to boot from and into which image to save a new bulk file), and IP PARAM file configuration. Rebooting the unit is also possible from this group.

7.4.5.6 Statistics Group

This group collects various statistics on Ethernet interface, satellite interfaces, and IP routing.

7.4.5.6.1 IP Routing Statistics Subgroup

This subgroup reports statistics collected by the IP router mechanism.

7.4.5.6.2 Ethernet Statistics Subgroup

This subgroup collects statistics reported on the Ethernet network card.

7.4.5.6.3 Satellite Statistics Subgroup

This subgroup collects statistics reported on the WAN (satellite interface) FPGA.

7.4.5.7 Demodulator Configuration Group

Whenever modifying the demodulator parameters by SNMP, the user must be aware that the following variables must be executed in this order:

1. ***FEC (Forward Error Correction***
2. ***Demodulation***
3. ***Code Rate***
4. ***Data Rate***

This group allows the user to configure the demodulator parameters, alarm masks, and internal reference adjustment. LNB units attached to the demodulator can also be configured.

For detailed OID information please refer to the actual MIB file.

7.4.5.7.1 Rx Parameters

This section allows the user to configure the demodulators' parameters.

7.4.5.7.2 Alarm Mask Parameters

This section allows the user to mask the AGC, Eb/No, and LNB alarms.

7.4.5.7.3 Reference Parameters

This section allows the user to change the internal reference adjustment.

7.4.5.7.4 LNB Parameters

This section allows the user to configure LNB parameters when an LNB is attached to the demodulator.

7.4.5.8 Monitor Group

This group reports the demodulator's status, including alarms, receive parameters, event log entries, statistics entries, and LNB parameters.

7.4.5.8.1 Unit Monitor

This section reports serial number, software revision, model number, and temperature. Any alarms that have been raised for the unit are also available.

7.4.5.8.2 Rx Monitor

This section reports the demodulator's bit error rate (BER), buffer fill state, frequency offset, receive signal level, and Eb/No value. Alarms that have been raised on a specific demodulator are also reported.

7.4.5.8.3 LNB Monitor

This section reports LNB unit status, including LNB current, LNB voltage, and any alarms.

7.4.5.8.4 Stored Events Log

The event log is a table that informs the user of any faults that have occurred in the demodulators. Event entries may also include informational items, such as power on/off.

7.4.5.8.5 Stored Statistics

The statistics log is a table that gathers data concerning receive Eb/No. The user can decide to collect these statistics on intervals ranging from 10 minutes to 90 minutes.

7.4.5.9 Utilities Group

This group allows the user set the unit's time and date, and set the circuit ID string per demodulator.

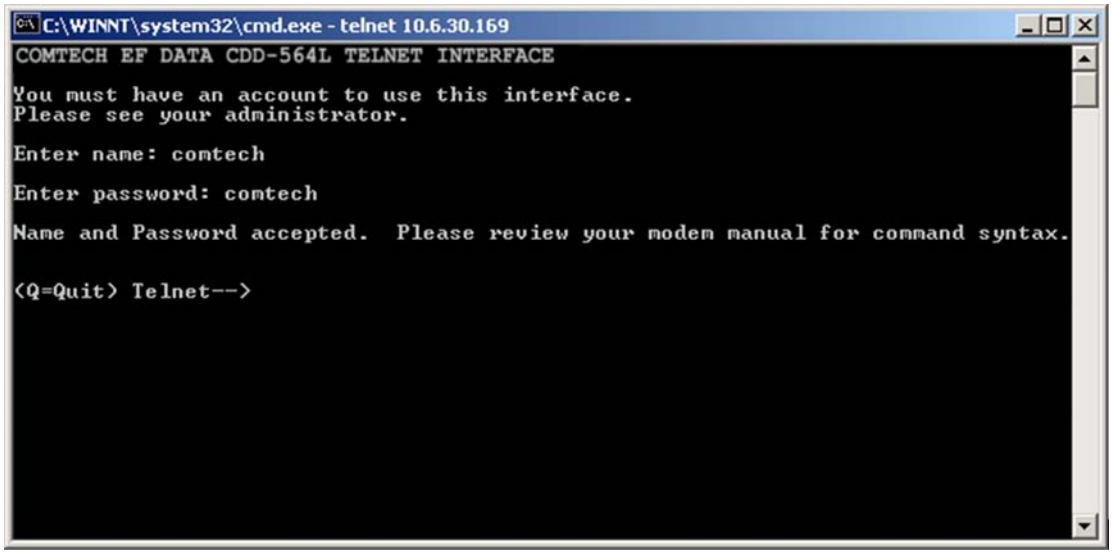
7.5 Telnet Interface

The modem provides a Telnet interface for two primary functions:

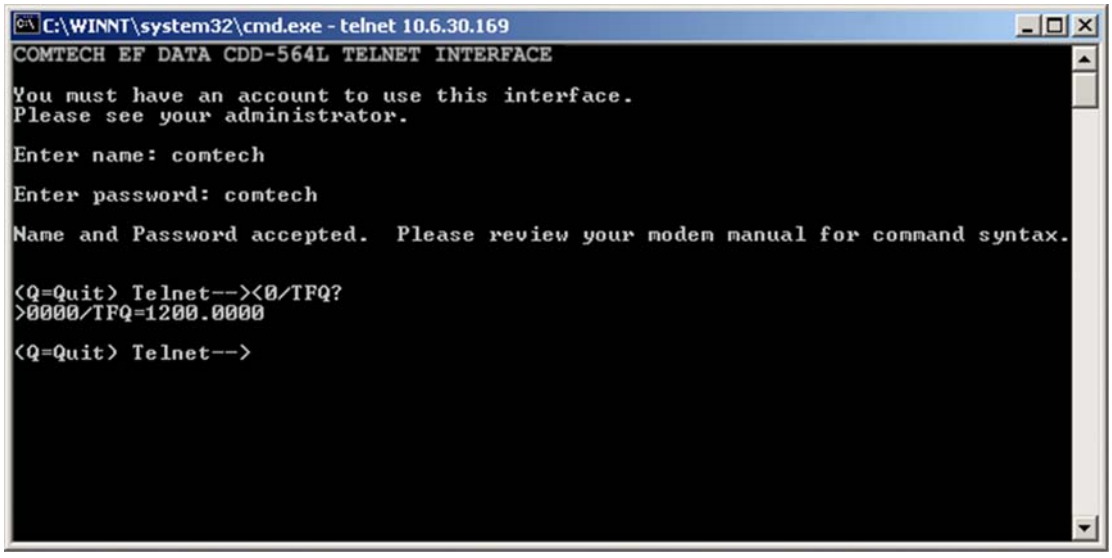
- Equipment M&C via the Command Line Interface (CLI) application. For further details about using this application, refer to **Chapter 9. IP MODULE CLI AND TELNET OPERATION**.
- Equipment M&C via Comtech EF Data's CDM/CDD NMCS application and associated Remote Control protocol. For further details about using this application, refer to **Appendix X. NMCS PROTOCOL**.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level.

The following screen capture shows this login process:


C:\WINNT\system32\cmd.exe - telnet 10.6.30.169
COMTECH EF DATA CDD-564L TELNET INTERFACE
You must have an account to use this interface.
Please see your administrator.
Enter name: comtech
Enter password: comtech
Name and Password accepted. Please review your modem manual for command syntax.
<Q=Quit> Telnet-->

Once logged into the Telnet interface as the Administrator, the user can access the NCMS interface defined in **Appendix D. CDM/CDD NMCS PROTOCOL, REV 1.0**, as shown in the following example:

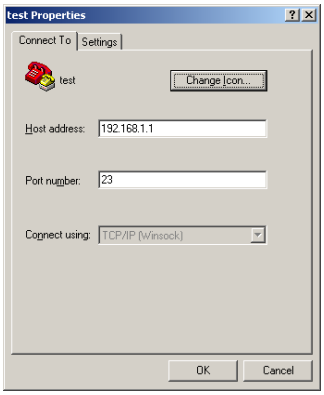

C:\WINNT\system32\cmd.exe - telnet 10.6.30.169
COMTECH EF DATA CDD-564L TELNET INTERFACE
You must have an account to use this interface.
Please see your administrator.
Enter name: comtech
Enter password: comtech
Name and Password accepted. Please review your modem manual for command syntax.
<Q=Quit> Telnet--><0/TFQ?
>0000/TFQ=1200.0000
<Q=Quit> Telnet-->

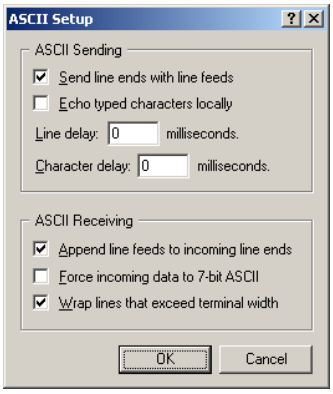
There is a disadvantage when using Windows DOS as Telnet Client. Since Windows DOS cannot translate a '\r' to a '\r\n' for the messages coming from Telnet Server, the multi-line command response (for example, **FRW?** response) will be displayed as one line, with the latter lines overwriting the previous lines.

In order to view the full response messages, CEFD recommends using HyperTerminal configured as Telnet Client. To do so, configure HyperTerminal as follows:

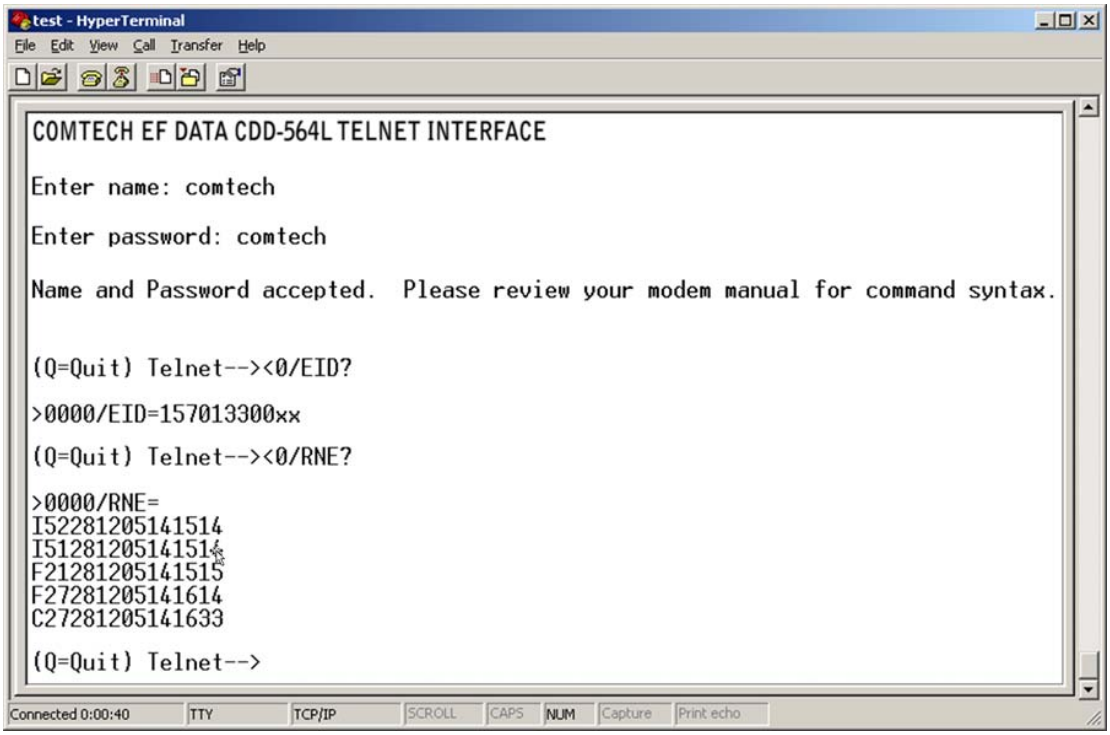
1. Under the HyperTerminal **Properties** tab: Connect using TCP/IP instead of COM1 or COM2.
2. Under the **Settings** tab, ASCII setup (far right): For **ASCII Sending**, check "**Send line ends with line feeds**".

   For **ASCII Receiving**, check "**Append line feeds to incoming line ends**".





The following screen capture shows an example of HyperTerminal configured as Telnet Client:



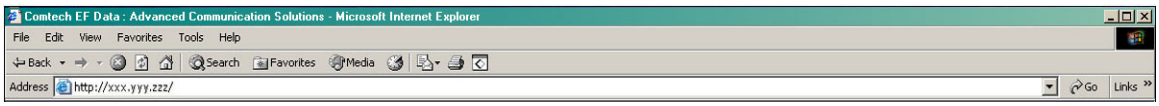
Chapter 8. WEB SERVER (HTTP) INTERFACE

8.1 Overview

This chapter describes the functionality of the CDD-56X Satellite Demodulator with IP Module's Web Server (HTTP) Interface. Please refer to **Chapter 9. IP MODULE – CLI AND TELNET OPERATION** or the IP Commands tables found in **Appendix D. CDM/CDD NMCS PROTOCOL, REV 1.0** for detailed descriptions of the configuration parameters featured on the individual Web pages depicted in this chapter.

8.1.1 Initial Access to the Web Server (HTTP) Interface

To initiate a Web session with the CDD-56X Demodulator, from the PC type *http://www.xxx.yyy.zzzz* (where "*www.xxx.yyy.zzz*" represents the IP address of the demodulator) into the **Address** area of the Web browser:


Comtech EF Data : Advanced Communication Solutions - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://xxx.yyy.zzz/
Go Links

With a properly configured demodulator, the Login window will appear, and the user is prompted to type a User Name and Password:

Observe the following:

Demodulator default User Name – **comtech**

Demodulator default Password – **comtech**

Type the User Name and Password, then click **[OK].**

Once the valid IP address has been entered, the CDD-56X Web Server Interface "splash" (Home) page, shown in **Figure 8-1**, is displayed. From this top level menu, the user has access to six navigation tabs.

8.1.2 Introduction to the Web Server Interface

Note: For the purpose of example, this chapter features pages from the CDD-564 or CDD-564L Web Server Interfaces. Functionality that is not typical for all demodulators is noted accordingly.

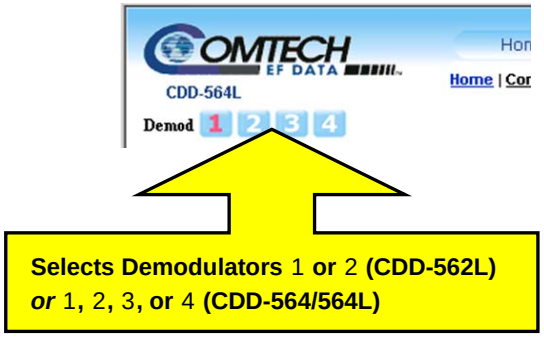
The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the CDD-56X. These Web pages have been designed for optimal performance when using Microsoft's Internet Explorer Version 5.5 or higher (the examples shown use Internet Explorer Version 6.0).

By rolling the cursor over the navigation tabs located at the top of each page (right), the user can select from the available nested hyperlinks.

8.1.3 Selecting Demodulators

There are two demod channels available on the CDD-562L; four demod channels are available on the CDD-564/564L.

Select the individual demodulator channel number, located in the upper left hand corner of every web page, to designate that demodulator as *active*. Web pages that do not impact *per-Demod* parameters (i.e., routes, administrative pages, etc.) are not affected by any change to this demodulator selection.



8.2 Web Server Interface Page Descriptions

Refer to the following chapter sections for the Web Server Interface page available either top-level or nested (i.e., accessible via hyperlink) under the navigation tabs that are accessible at the top of each page:

For:	Refer to:
"Splash" (Home) Page	Sect. 8.2.1
Home Pages	Sect. 8.2.2
Admin (Administration) Pages	Sect. 8.2.3
Demod (Configure Demodulator) Pages	Sect. 8.2.4
IP Pages	Sect. 8.2.5
Stats Pages	Sect. 8.2.6
Maint (Maintenance) Pages	Sect. 8.2.7

8.2.1 "Splash" (Home) Page

Figure 8-1. CDD-56X "Splash" page

The "splash" page (**Figure 8-1**) is the same page accessed by clicking the **Home** hyperlink**.** This page 'welcomes' the user to the CDD-56X Web Server Interface.

8.2.1.1 Web Server Interface Menu Tree

The options available through the CDD-56X Web Server Interface are illustrated via the following menu tree:

Home	Admin	Demod	IP	Stats	Maint
Home	Summary	***Demod***	Ethernet	Ethernet	Unit Info
Contact	Access	***Utilities***	***HDLC***	IP	Operations
Support	Features	***Status***	Routes	***WAN***	Save
Logoff	SNMP	***Events***	Multicast		Reboot
	Decryption	***Statistics***	ARP		
		LNB*	IGMP		

Web pages that afford monitor and control over the individual demod channels – i.e., M&C on a *per-Demod* basis – are shown in this menu tree as ***bold/italicized***. Otherwise, the pages available on this interface impact operations on a *per-Unit* (system level) basis *only*.

***Note:** The '**LNB**' hyperlink is available only on the CDM-562L/564L Web Server Interfaces. Depending on the unit in use and the number of configured modulators on that unit, this page provides the user with the means to control and monitor up to four Low-Noise Block Downconverters (LNBs), on a per-Demod basis, when connected to the CDD-562L/564L.

Click any tab and/or hyperlink to continue.

8.2.2 Home Pages

From any location within the Web Server Interface, the user can select the **Home** tab and/or **Home** hyperlink to return back to the top-level "splash" page shown in **Figure 8-1**.

8.2.2.1 Home | Contact

Figure 8-2. Home | Contact page

The **'Home | Contact'** page (**Figure 8-2**) provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone or automated E-mail links.

8.2.2.2 Home | Support

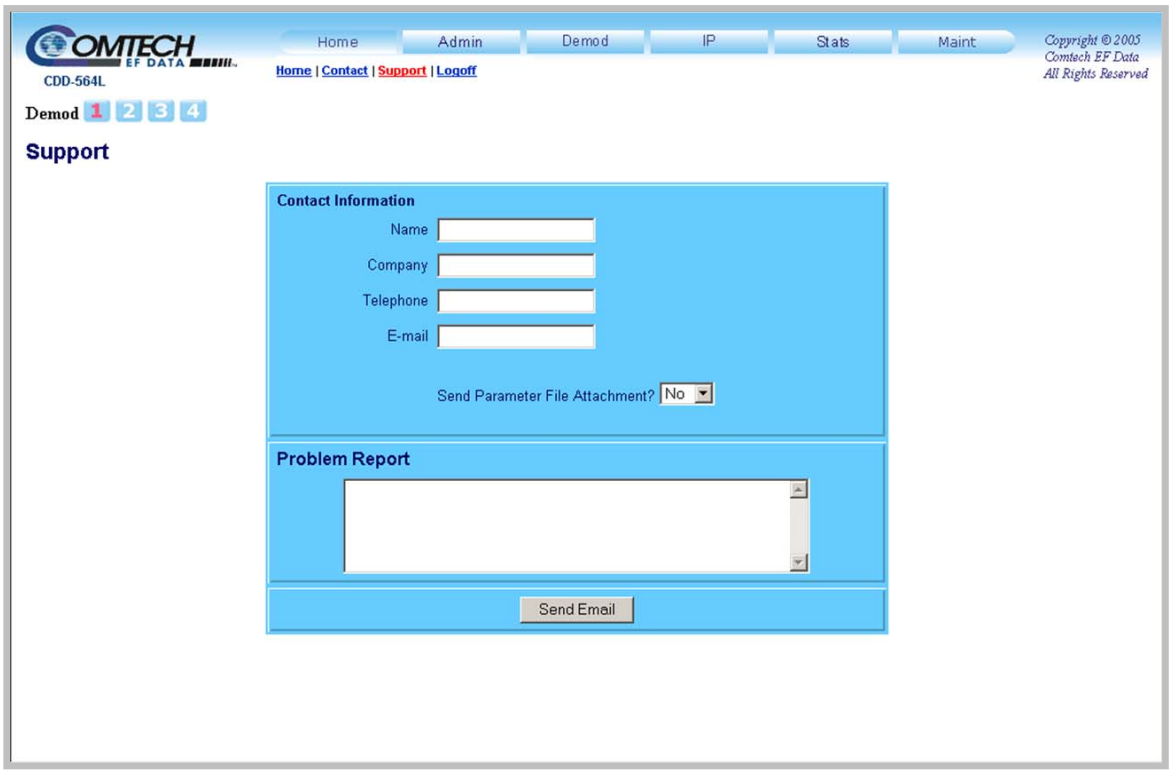


Figure 8-3. Home | Customer Support page

Use the **'Home | Support'** page (**Figure 8-3**) to compose an E-mail message for questions or problems with the CDD-56X. The user can also select to automatically attach the demodulator's parameter file (containing the unit serial number and configuration information) in order to facilitate troubleshooting or to resolve configuration issues.

The **Problem Report** area of the display allows up to 2000 characters maximum.

The CDD-56X Support Web Page uses SMTP (Simple Mail Transport Protocol) to send E-mail to Comtech EF Data Technical Support (cdmipsupport@comtechefdata.com).

IMPORTANT

For this page to operate correctly, the demodulator's administrator is required to specify the SMTP server, domain name, and destination on the* Admin | Access *page (see Sect. 7.2.2.1).

Once the **Contact Information** is entered and a message composed in the **Problem Report** text window, click **[Send Email]** to send the message.

8.2.2.3 Home | Logoff

Figure 8-4. Home | Logoff page

At present, the demodulator only allows one connection to the CLI or the Web Interface. Use the **'Home | Logoff'** page (**Figure 8-4**) to formally disconnect from the Web Interface.

In response to the displayed prompt, click **[Yes, Disconnect]** to execute logoff from the session.

IMPORTANT

Upon disconnection, the user is required to close the Web Browser in order to delete the demodulator's security cookie.

8.2.3 Admin Pages

The hyperlinks available under the '**Admin'** tab provide the means to review or set up parameters required to facilitate communication with the CDD-56X Web Server Interface.

IMPORTANT

The Admin pages are available only to users who have logged in using the Administrator Name and Password.

8.2.3.1 Admin | Summary

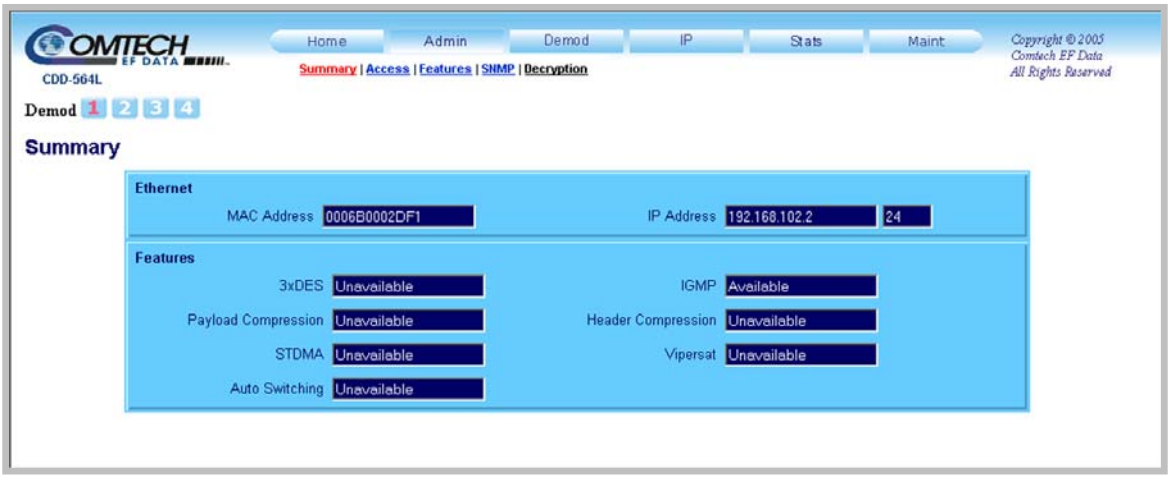


Figure 8-5. Admin | Summary page

Use the *read-only* '**Admin | Summary'** page (**Figure 8-5)** to view the unit's configured Ethernet MAC and IP addresses, and the installed/available FAST Features.

8.2.3.2 Admin | Access

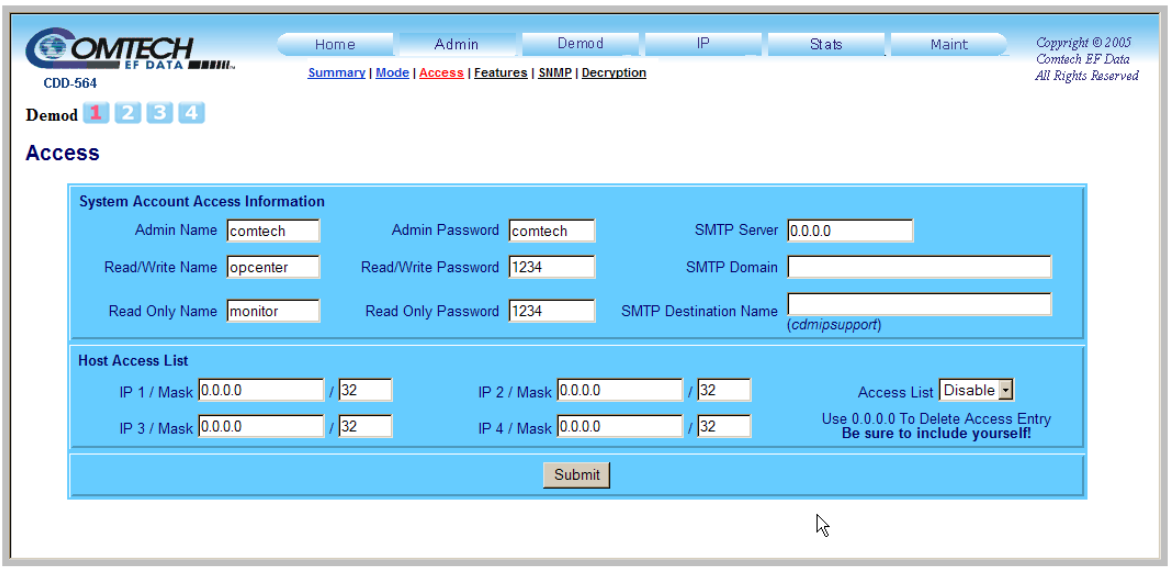


Figure 8-6. Admin | Access page

Use the '**Admin | Access'** page (**Figure 8-6)** to set up and maintain the user names, passwords, E-mail server, and host IP addresses as needed to facilitate communication with the CDD-56X Web Server Interface.

System Account Access Information

- **Admin, Read/Write, and Read Only Names and Passwords:** The factory defaults for these names/passwords are:
  - **Admin** comtech/comtech
  - **Read/Write** opcenter/1234
  - **Read Only** monitor/1234

  Note that the **Name** and **Password** fields can each accept any alphanumeric combination with a maximum length of 10 characters.
- **SMTP Server:** Specify the mail server IP address from where you want to send the E-mail.
- **SMTP Domain / Destination Name:** The Administrator can assign the SMTP Domain Name and Destination. This is required if the E-mail feature of the **'Home | Support'** Page (**Sect. 8.2.2.2** in this chapter) is to be used.
  - For **SMTP Domain Name**, specify the domain of the E-mail server (usually found to the right of the @ symbol in an E-mail address).
  - For **SMTP Domain Destination**,specify the E-mail recipient name (usually found to the left of the @ symbol in an E-mail address).

Host Access List

- **IP *(#)* / Mask:** The *Host Access List* is used to define which remote clients can connect when the *Access List* is **Enabled**. Each entry allows a user to specify an IP address and a subnet mask to define a unique class of machines that are allowed access.

  For example, if a user wanted to grant access to a PC with an IP Address of 10.10.10.1 and any PC on a subnet of 192.168.10.xxx, then the Access List would be defined as :

  IP 1 / Mask: 10.10.10.1/32

  IP 2 / Mask: 192.168.10.0/24

  For IP 3 / Mask and IP 4 / Mask, make sure they are not 0.0.0.0/0. An entry with 0.0.0.0/0 simply means any machine is allowed to access.

- **Access List:** Use the Access List to grant access via HTTP and SNMP to a well-defined list of client machines. From the drop-down, select **Enable** or **Disable**. If **Disabled**, then any client machine will be able to connect via HTTP and SNMP.

Once the desired configuration settings have been made on this page, click **[Submit]** to save these changes.

8.2.3.3 Admin | Features

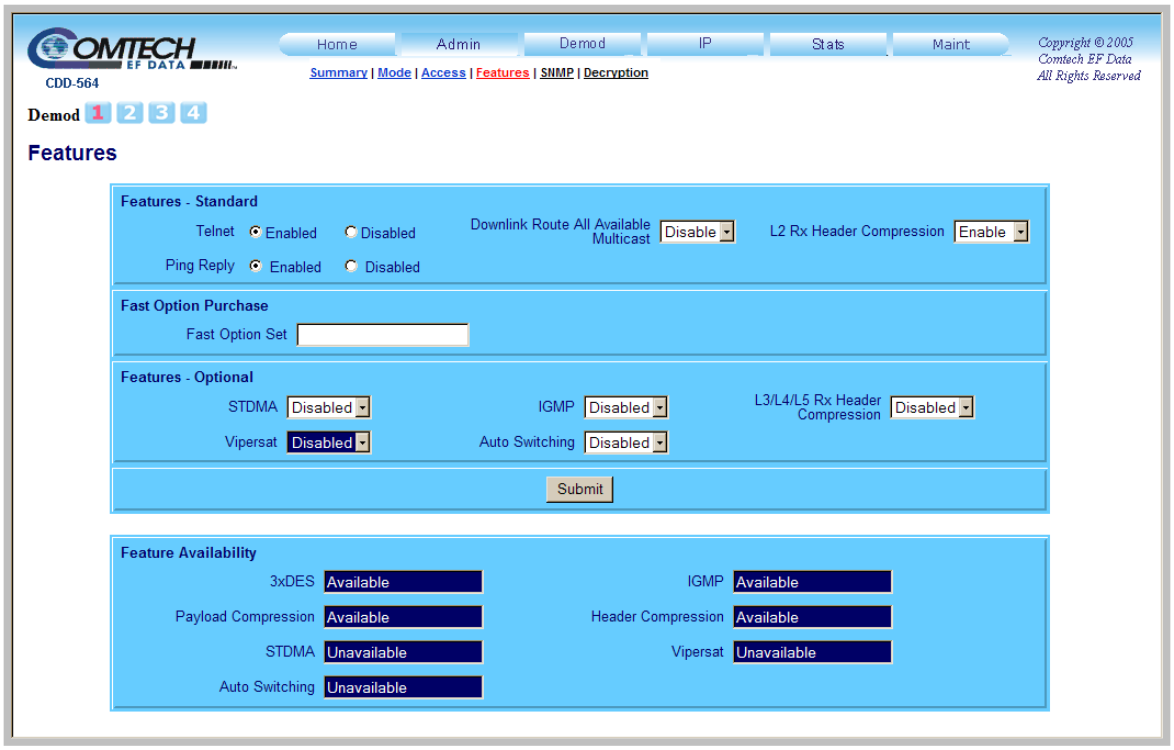


Figure 8-7. Admin | Features page

Use the '**Admin | Features'** page (**Figure 8-7)** to establish operating parameters for the demodulator's standard and optional features:

Features – Standard

- To set *Telnet* or *Ping Reply* functionality, click **Enabled** or **Disabled**.
- To set *Downlink Route All Available Multicast*, from the list, select **Enabled** or **Disabled**.
- To set *L2 Rx Header Compression*, from the list, select **Enabled** or **Disabled**.

Fast Option Purchase

Use the field provided here to enter the FAST Option Purchase Access Code obtained from Comtech EF Data – see **Appendix C. FAST ACTIVATION PROCEDURE** for further details .

Features – Optional

Using the drop-down menus, set operation for **STDMA**, **Vipersat**, **IGMP**, **Auto Switching**, or **L3/L4/L5 RX Header Compression** by clicking **Enabled** or **Disabled** (note that when a feature is unavailable, the drop-down list for that selection will be rendered *inoperable*).

Once the desired configuration settings have been made on this page, click **[Submit]** to save these changes.

Feature Availability

This *read-only* section displays the operational status of these features as **Available** (i.e., installed/operational) or **Unavailable** (must be purchased – contact Comtech EF Data to acquire the

FAST Option Purchase Access Code required to enable these features – see **Appendix C. FAST ACTIVATION PROCEDURE** for further details).

8.2.3.4 Admin | SNMP

IMPORTANT

Use of this page is restricted to users with Administrator login priveleges.

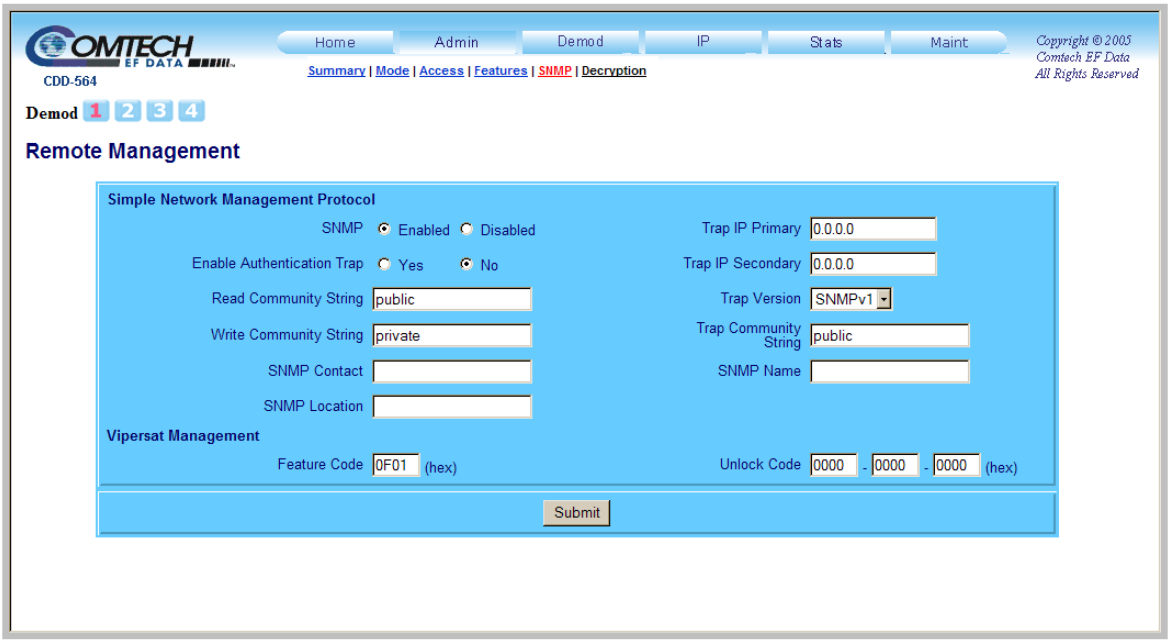


Figure 8-8. Admin | SNMP page

Use the '**Admin | SNMP'** page (**Figure 8-8**) to set and return administration information for the CDM-56X *Simple Network Management Protocol (SNMP)* and *Vipersat* features.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 5. FRONT PANEL OPERATION** and **Sect. 7.4 SNMP INTERFACE**.

Simple Network Management Protocol

The Administator may:

- Set **Simple Network Management** and **Enable Authentication Trap**, using the associated drop-downs, as **Enabled** or **Disabled**.
- Assign up to two SNMP **Trap IP** addresses (**Trap IP Primary** and **Trap IP Secondary**).
- Set the **Trap Version**, using the associated drop-down, as **SNMPv1** or **SNMPv2**.
- Assign SNMP **Read**, **Write**, and **Trap Community Strings**. The factory defaults for these parameters are as follows:
  - *Read Community String* public
  - *Write Community String* private
  - *Trap Communty String* comtech

Each Community String can be from 0 minimum to 20 maximum characters in length; any combination of characters may be used.

- Assign an **SNMP Contact**, **SNMP Name**, and **SNMP Location**.

Vipersat Management

For details on configuration and use of the CDD-56X Web Server Interface's Vipersat feature, please consult adjunct Comtech EF Data publication **MN/22137 – *Vipersat CDD-56X Series Satellite Network Demodulator Router User Guide***.

Once the desired configuration settings have been made on this page, click **[Submit]** to save these changes.

8.2.3.5 Admin | Decryption

IMPORTANT

This page will only be accessible when the 3xDES FAST feature has been purchased and the license key has been entered.

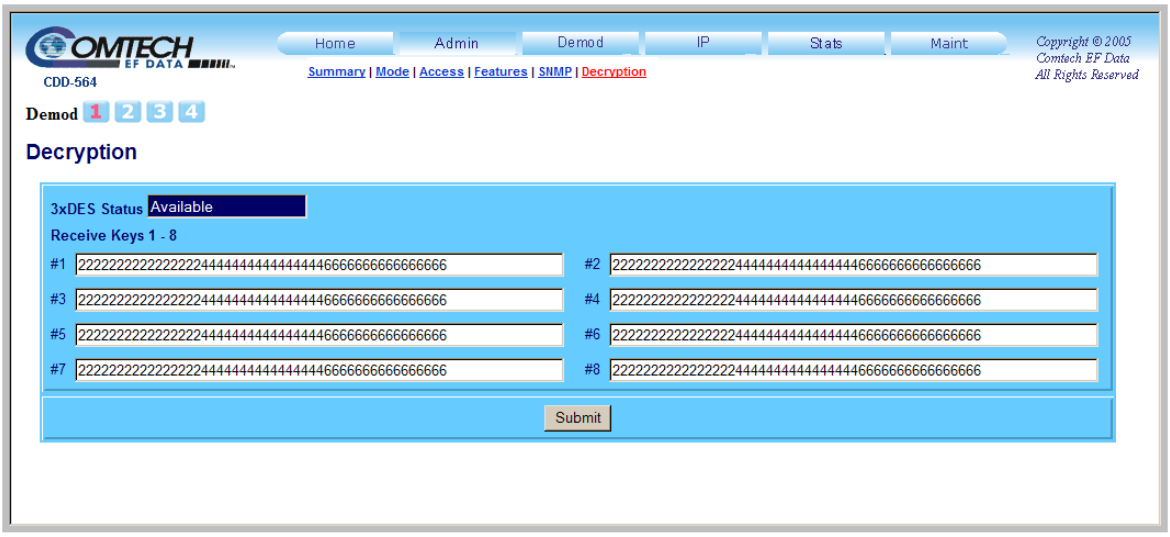


Figure 8-9. Admin | Decryption page

The '**Admin | Decryption**' page (**Figure 8-9**) indicates whether 3xDES (also referred to as *Triple DES*) encryption is enabled for use with the CDD-56X and, if availables, the 3xDES keys that are used to decrypt traffic.

For further details on 3xDES operation, refer to **Sect. 9.3.1.4** in **Chapter 9. IP MODULE CLI / TELNET OPERATION**.

8.2.4 Demod (Configure Demodulator) Pages

The hyperlinks available under the '**Demod**' tab provide the user with the means to configure all demodulator parameters.

Note: The '**LNB**' hyperlink is available only on the CDM-562L/564L Web Server Interfaces. Depending on the unit in use and the number of configured modulators on that unit, this page provides the user with the means to control and monitor up to four Low-Noise Block Downconverters (LNBs), on a per-Demod basis, when connected to the CDD-562L/564L.

8.2.4.1 Demod | Demod

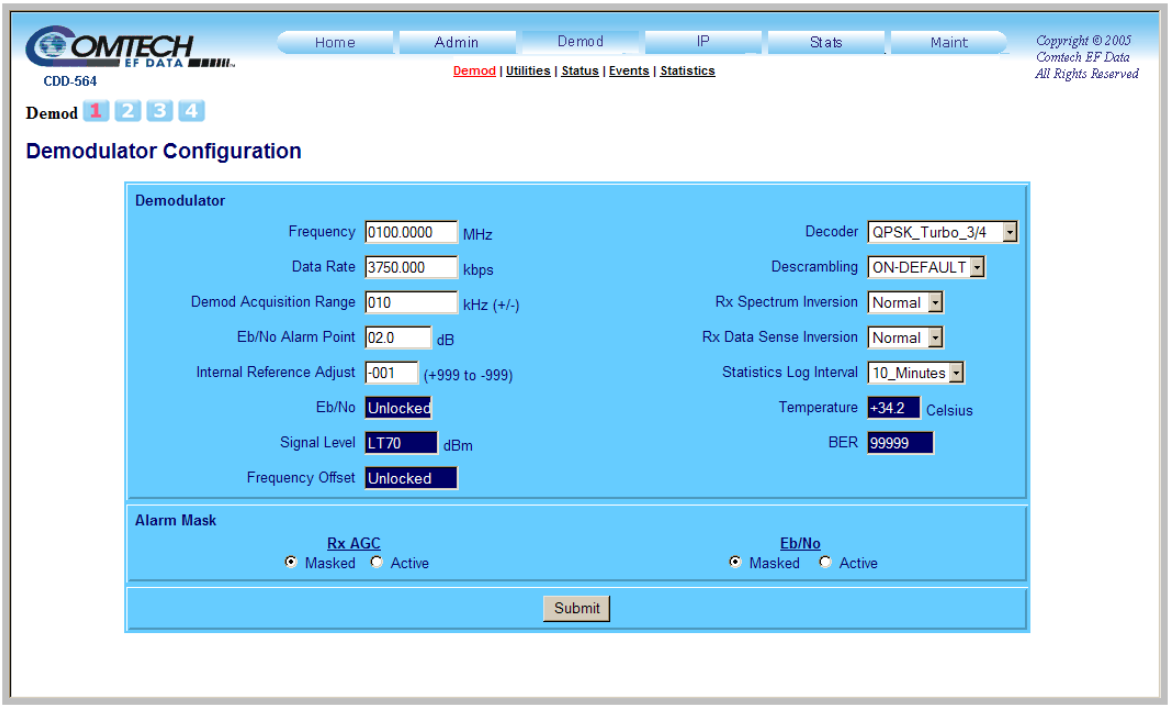


Figure 8-10. Demod | Demod page

Use the '**Demod | Demod'** page (**Figure 8-10**), on a per-Demod basis, to configure demodulator operating (Rx) parameters, view current performance statistics, and select the *Rx AGC* or *Eb/No* Alarm Masks as **Masked** or **Active**.

IMPORTANT

The Rx Interface Types have highest priority and should be configured before setting any other parameters.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 5. FRONT PANEL OPERATION**.

Once the desired configuration settings have been made in each section, click **[Submit]** as needed in that section to save those changes.

8.2.4.2 Demod | Utilities

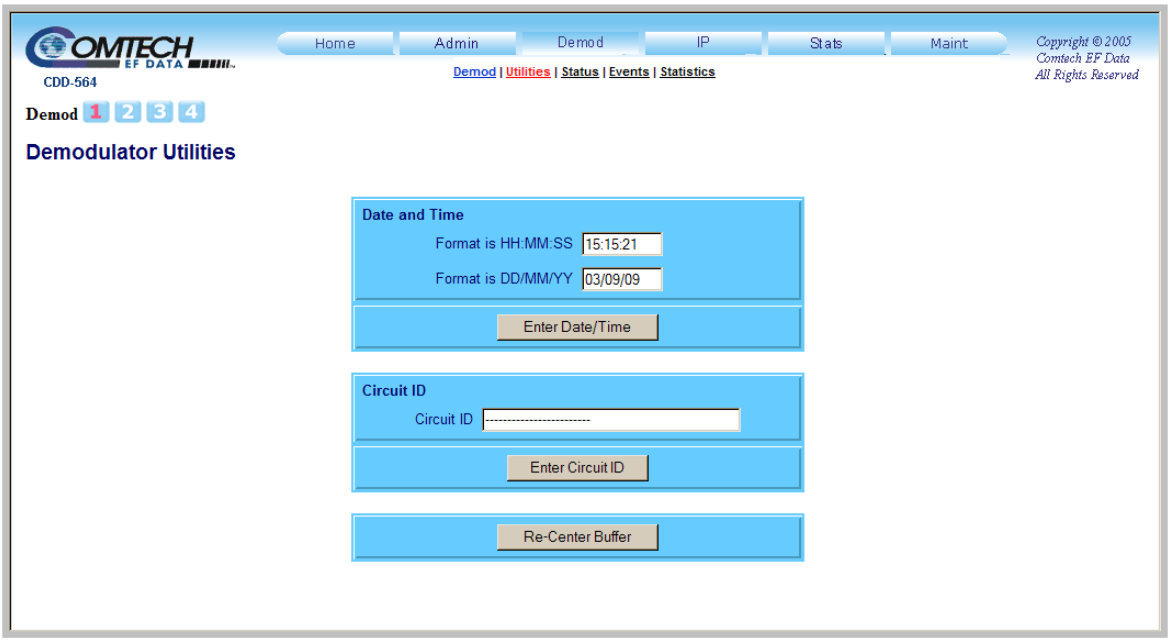


Figure 8-11. Demod | Utilities page

Use the '**Demod | Utilities'** page (**Figure 8-11**) to configure the following CDM-570/570L utility functions:

Date and Time

- Enter a date using international format in the form DD/MM/YY (where DD = day [01 to 31], MM = month [01 to 12], and YY = year [00 to 99]).
- Enter a time using HH:MM:SS format (where HH = hour [00 to 23], MM = minutes [00 to 59], and SS = seconds [00 to 59]).

Once the desired date and time have been entered in this section, click **[Enter Date/Time]** as needed to save these changes.

Circuit ID

- Enter a Circuit ID string of up to 24 characters. Once the desired string had been entered in this section, click **[Enter Circuit ID]** as needed to save this change.

Re-Center Buffer

- Click **[Re-Center Buffer]** to force re-centering of the Plesiochronous/Doppler buffer.

8.2.4.3 Demod | Status

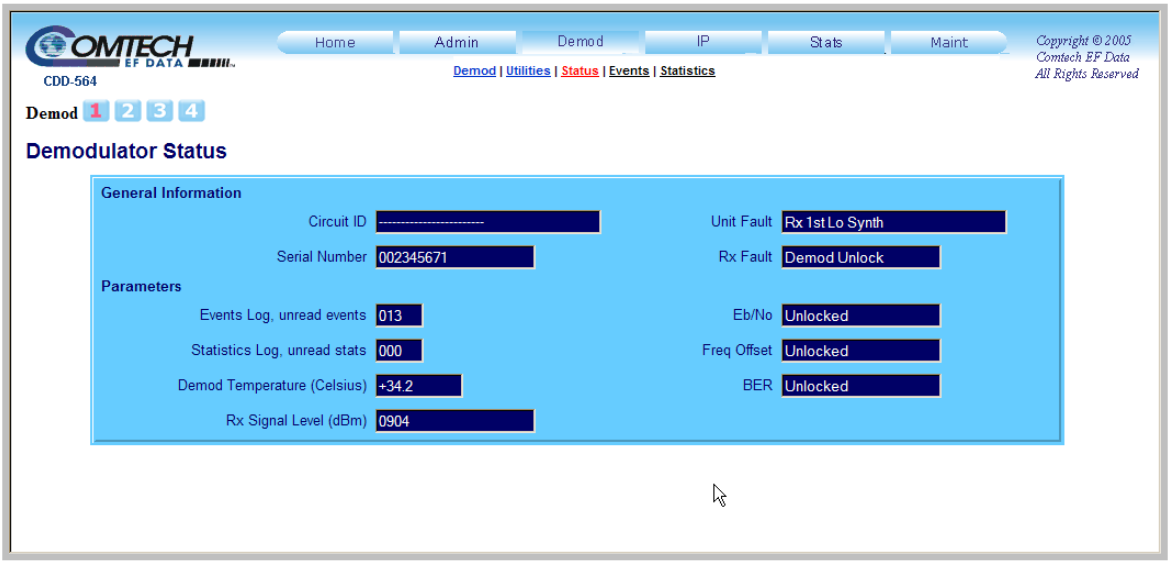


Figure 8-12. Demod | Status page

Use the '**Demod | Status'** page (**Figure 8-12**) to view *read-only* information on a per-Demod basis:

- Circuit ID
- Demodulator Serial Number
- Latest Unit Fault
- Latest Rx Fault
- Number of unread events in Event Log
- Number of unread statistics in the Statistics Log
- Demod Temperature (in degrees Celsius)
- Rx Signal Level, in dBm
- Eb/No status
- Frequency Offset status
- BER status

8.2.4.4 Demod | Events

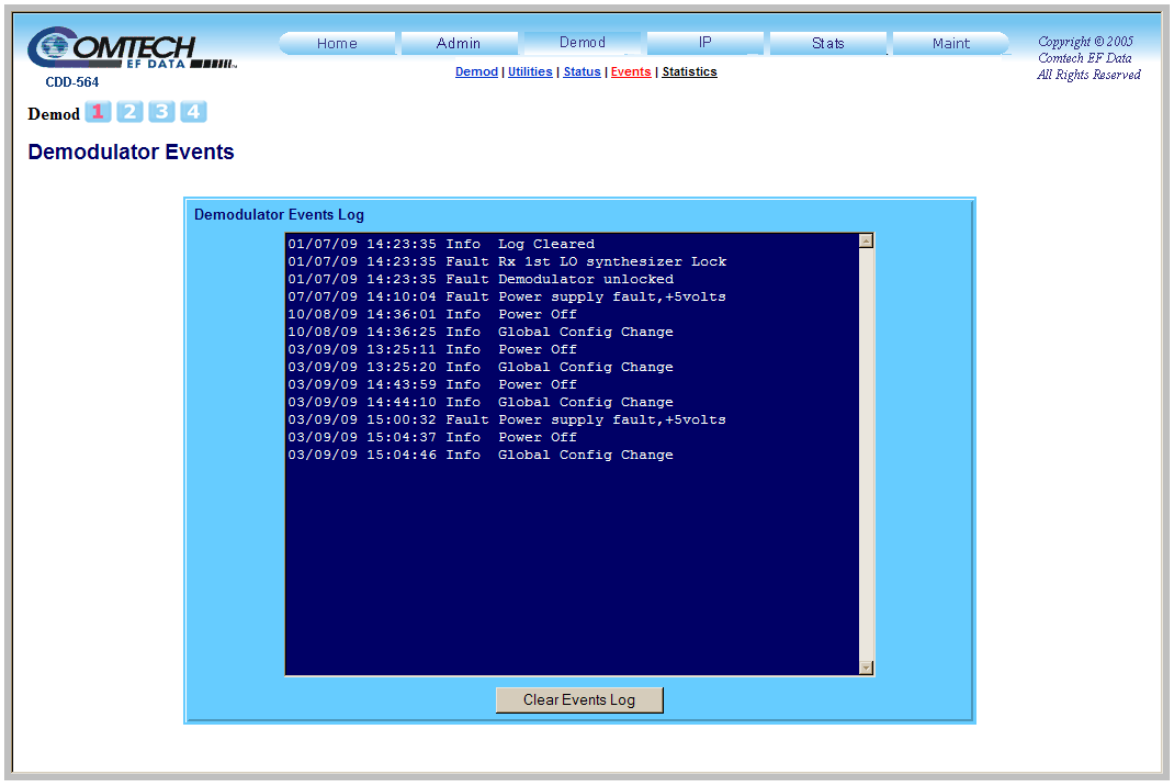

COMTECH EF DATA
CDD-564
Home
Admin
Demod
IP
Stats
Maint
Demod | Utilities | Status | Events | Statistics
Copyright © 2005
Comtech EF Data
All Rights Reserved
Demod 1 2 3 4
Demodulator Events
Demodulator Events Log
01/07/09 14:23:35 Info Log Cleared
01/07/09 14:23:35 Fault Rx 1st LO synthesizer Lock
01/07/09 14:23:35 Fault Demodulator unlocked
07/07/09 14:10:04 Fault Power supply fault,+5volts
10/08/09 14:36:01 Info Power Off
10/08/09 14:36:25 Info Global Config Change
03/09/09 13:25:11 Info Power Off
03/09/09 13:25:20 Info Global Config Change
03/09/09 14:43:59 Info Power Off
03/09/09 14:44:10 Info Global Config Change
03/09/09 15:00:32 Fault Power supply fault,+5volts
03/09/09 15:04:37 Info Power Off
03/09/09 15:04:46 Info Global Config Change
Clear Events Log

Figure 8-13. Demod | Events page

The '**Demod | Events'** page (**Figure 8-13**) provides a *read-only* window that displays Faults or Alarms (Events) as logged by the unit on a system-wide basis during the course of normal operation.

Click **[Clear Events Log]** to delete all existing log entries from the Demodulator Events Log. The log is then reset to one (1) entry: "**Info___Log Cleared**".

For further details pertaining to the information provided on this page, refer to **Chapter 5. FRONT PANEL OPERATION**.

8.2.4.5 Demod | Statistics

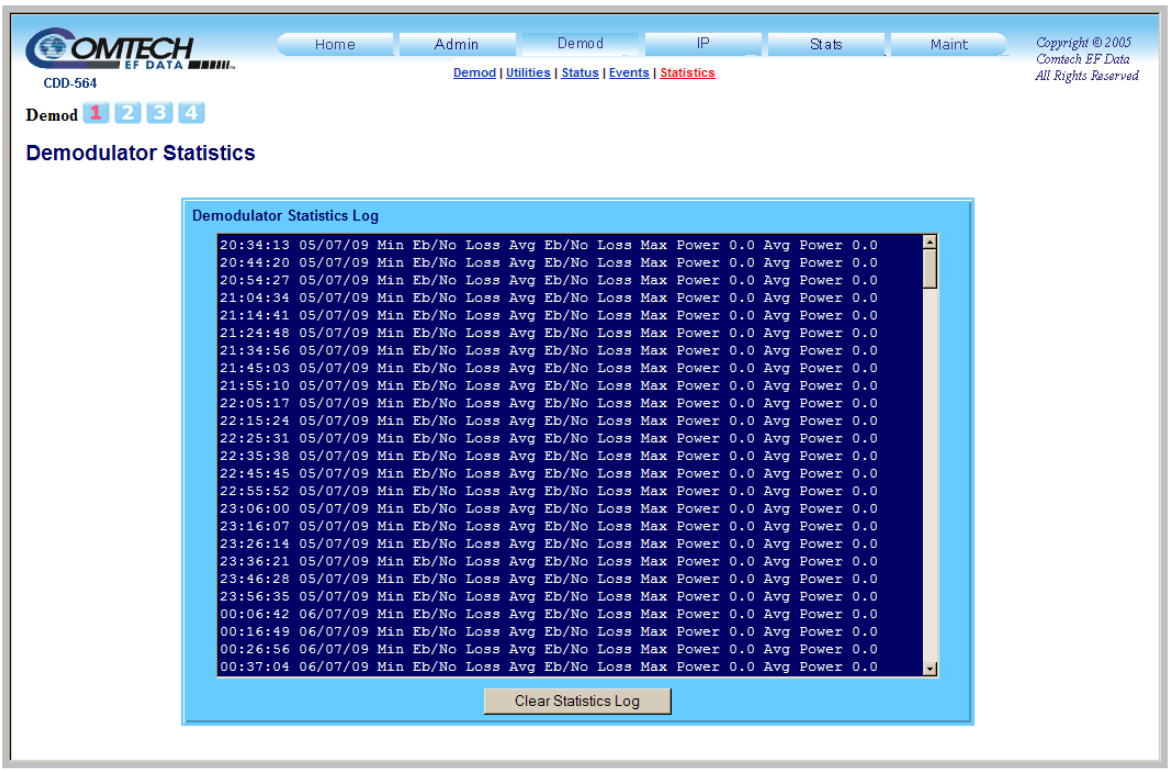

COMTECH EF DATA
CDD-564
Home
Admin
Demod
IP
Stats
Maint
Demod | Utilities | Status | Events | Statistics
Copyright © 2005 Comtech EF Data All Rights Reserved
Demod 1 2 3 4
Demodulator Statistics
Demodulator Statistics Log
20:34:13 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
20:44:20 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
20:54:27 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
21:04:34 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
21:14:41 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
21:24:48 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
21:34:56 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
21:45:03 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
21:55:10 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
22:05:17 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
22:15:24 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
22:25:31 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
22:35:38 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
22:45:45 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
22:55:52 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
23:06:00 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
23:16:07 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
23:26:14 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
23:36:21 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
23:46:28 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
23:56:35 05/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
00:06:42 06/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
00:16:49 06/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
00:26:56 06/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
00:37:04 06/07/09 Min Eb/No Loss Avg Eb/No Loss Max Power 0.0 Avg Power 0.0
Clear Statistics Log

Figure 8-14. Demod | Statistics page

The '**Demod | Statistics'** page (**Figure 8-14**) provides a *read-only* window that display any operating Statistics as logged by the unit on a per-Demod basis during the course of normal operation.

Click **[Clear Statistics Log]** to delete all existing entries from the Demodulator Statistics Log.

For further details pertaining to the information provided on this page, refer to **Chapter 5. FRONT PANEL OPERATION**.

8.2.5 IP Pages

The hyperlinks available under the '**IP**' tab provide the user access to all functionality associated with Ethernet operation.

8.2.5.1 IP | Ethernet

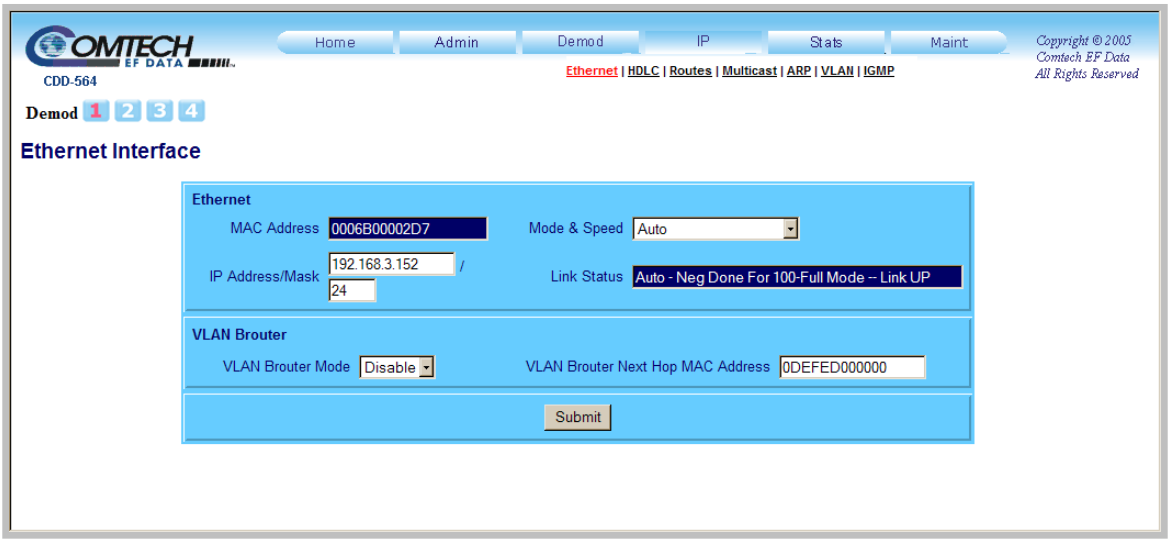


Figure 8-15. IP | Ethernet page

Use the '**IP | Ethernet'** page (**Figure 8-15)** to view the MAC address and Link Status, and set the IP address/mask, and mode/speed of the IP Module:

Ethernet

- **MAC Address (*read-only*):** This is set at the factory to a guaranteed unique address that cannot be modified by the user.
- **Mode & Speed:** Use the drop-down list box to select **Auto**, **10 Mbps Half Duplex**, **100 Mbps Half Duplex**, **10 Mbps Full Duplex**, or **100 Mbps Full Duplex**.
- **IP Address/Mask:** The user may enter the IP Address/Mask for the IP Module Ethernet Interface.
- **Link Status (*read-only*)**: The is the actual negotiated Link Status of the Ethernet Port; this includes whether the link is **UP** or **DOWN**.

VLAN Brouter

The VLAN Brouter feature allows VLAN tagged packets to be forwarded when in Brouter mode. ***In order for this feature to work, Header Compression must be purchased and available.***

- **VLAN Brouter Mode:** Use the associated drop-down to select this mode as **Enabled** or **Disabled**. Observe the following:
  - This mode can be enabled only when one of the Router modes is **enabled**.
  - When Managed Switch Mode is enabled, this feature is automatically **disabled**.

- **VLAN Brouter Next Hop MAC Address** – When VLAN Brouter Mode is **enabled**, the user may enter into this text box the Next Hop MAC Address to which VLAN tagged packets are to be directed.

Once the desired settings have been configured, click **[Submit]** to save those changes.

8.2.5.2 IP | HDLC

Typical CDM-IP modems support two Working Modes: easyConnect™ and Router Mode. For the CDD-56X Satellite Demodulator, three primary HDLC Addressing (Router) Modes – Point-to-Point, Small Network, and Large Network – are available. Once the role of a particular modem in the network is determined, this single point of configuration is intended to simplify deployment.

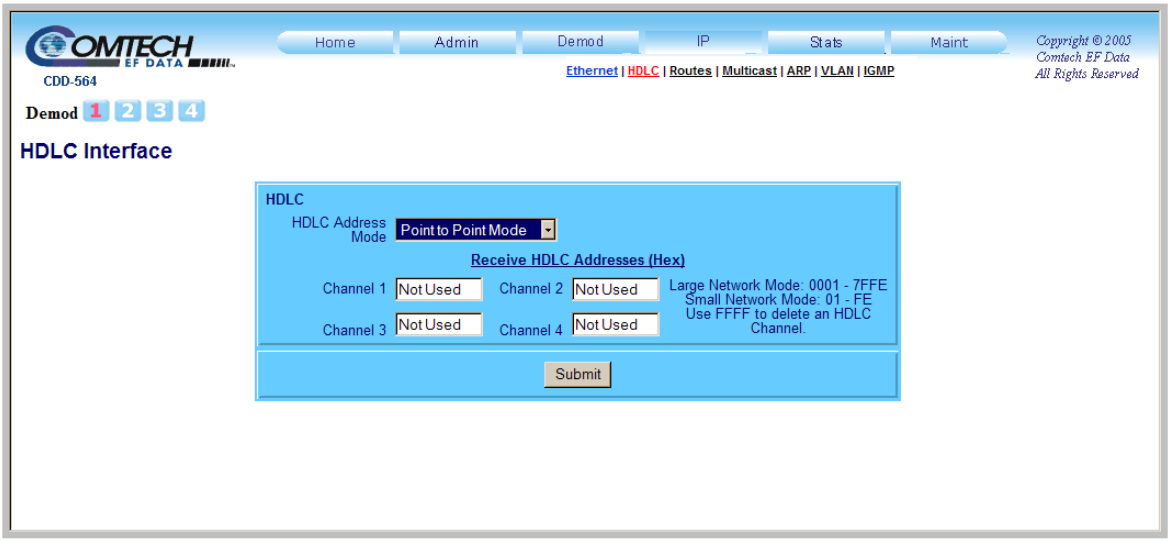


Figure 8-16. IP | HDLC page

Use the '**IP | HDLC'** page (**Figure 8-16)** to specify the Router Mode for the CDM-IP modem/CDD-56X pairing.

IMPORTANT

1. ***The demodulator only supports Router Mode, so the CDM-IP modem that is transmitting to the CDD-56X demodulator must be in Router Mode.***
2. ***The HDLC Address Mode of the Comtech EF Data IP modems must be identical to pass traffic between the TX modems and the demodulator.***

HDLC Address Mode

Using the associated drop-down, select the active HDLC Address (Router) Mode. As noted previously, the choices are as follows:

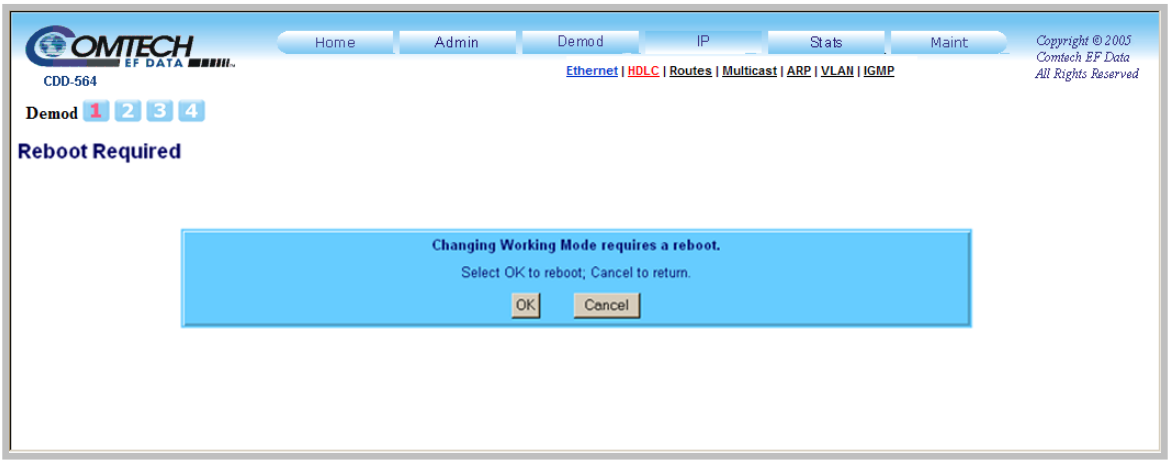
- **Router – Point-to-Point Mode:** Select for use in a Point-to-Point SCPC link where there are different IP subnets on either side of the link.
- **Router – Small Network Mode:** The Small Network Mode supports up to 255 remotes, as allowed using HDLC addressing. Select to set the unit to be on independent IP subnets; requires adding static routes to pass traffic between them.

- **Router – Large Network Mode:** This mode is similar to Small Network Mode, the exception being that a maximum of 32,766 remotes are allowed on a single shared satellite outbound carrier.
- **Router – Vipersat Mode:** For details on configuration and use of the CDD-56X Web Server Interface's Vipersat feature, please consult adjunct Comtech EF Data publication **MN/22137 – *Vipersat CDD-56X Series Satellite Network Demodulator Router User Guide***.
- **Managed Switch Mode:** This mode functions as a learning bridge with these additional features: QoS, Header Comp, Payload Comp, VLAN, and 3xDES. No routes are required in this mode.

Receive HDLC Addresses (Hex): The address may be assigned, on a per-channel (per-Demod) basis within the following ranges:

- Point-to-Point: No HDLC address
- Small Network: 0x1 – 0xFE
- Large Network: 0x1 – 0xFFFE

If a selected working mode differs from the currently active mode, the user is prompted to reboot the CDD-56X:



Click **[OK]** to reboot the unit, or **[Cancel]** to return to the '**IP | HDLC'** page.

8.2.5.3 IP | Routes

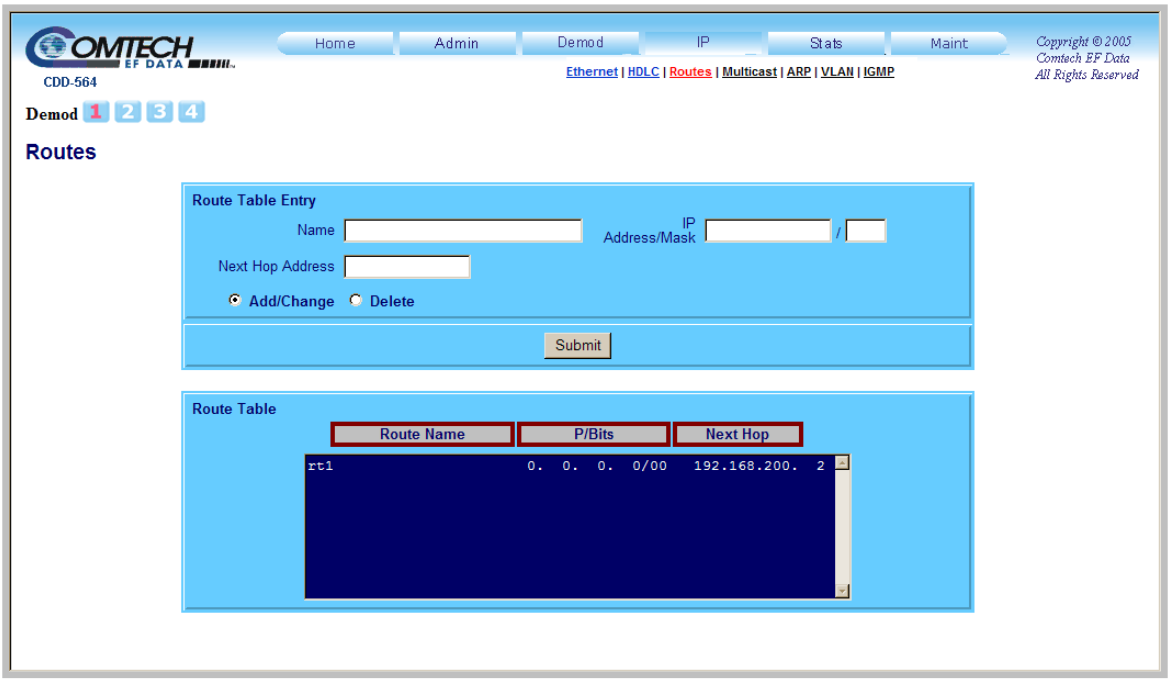


Figure 8-17. IP | Routes page

Use the '**IP | Routes'** page (**Figure 8-17)** to enter static routes into the IP Module, on a per-Demod basis, for the purpose of routing IP traffic over the satellite or to another device on the local LAN.

Route Table Entry

- **Name:** Provided to help users maintain their network, the assigned name cannot contain any whitespace and must be unique.
- **IP Address/Mask:** This address defines the route to the destination network.
- **Next Hop Address:** When the route is of type Sat to Eth (as per the **'IP | Multicast'** page), the **Next Hop Address** is used to define the locally attached router's IP address, which can be used to route to the destination network. This is the case when there is another subnet addressed to the modem on the LAN side. The address may be assigned, dependant on the selected Working Mode, within the following ranges:
  - Point-to-Point: No HDLC address
  - Small Network: 0x1 – 0xFE
  - Large Network: 0x1 – 0xFFFE
- **Add/Change:** Click to add a Route Entry to the Route Table or modify an existing entry. The entry will be added to the table (or the existing entry modified) for processing once the user clicks **[Submit]**.
- **Delete:** Click to flag a Route Entry for removal from the Static Route Table. The entry will be deleted from the table once the user clicks **[Submit]**.

Route Table

This *read-only* window displays the currently active Route Table entries.

8.2.5.4 IP | Multicast

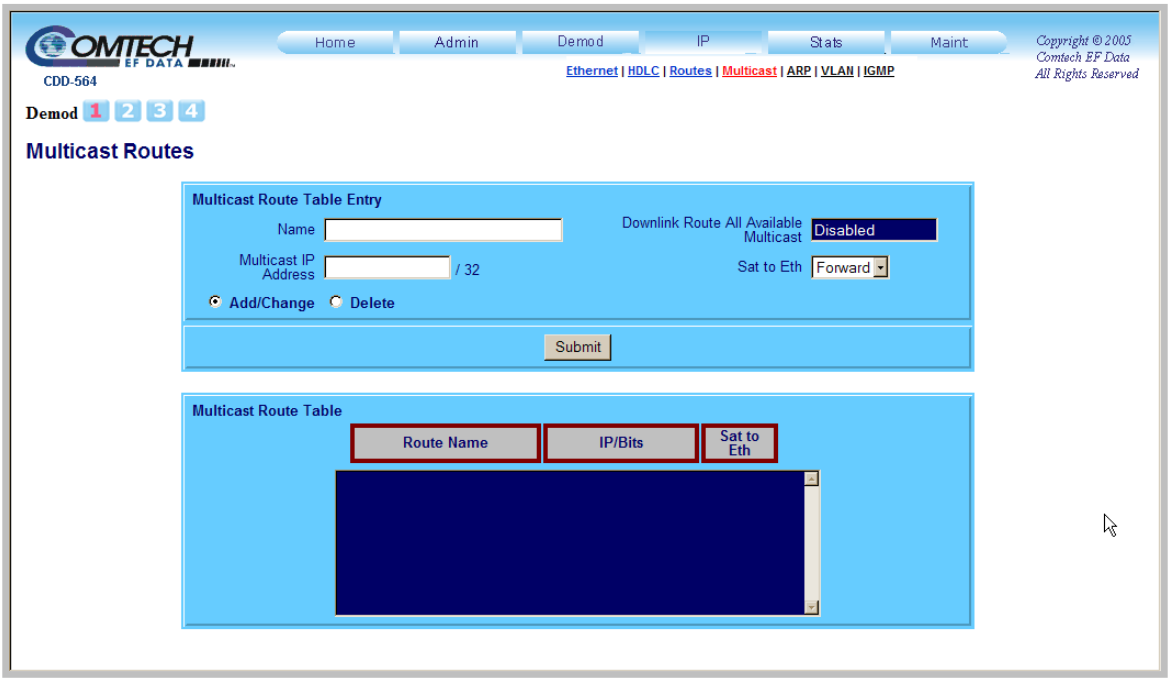


Figure 8-18. IP | Multicast page

Use the '**IP | Multicast'** page (**Figure 8-18)** to enter multicast routes into the IP Module to route multicast IP traffic over the satellite or to another device on the local LAN.

Multicast Route Table Entry

- **Name** – String label provided to help users maintain their network. The assigned name cannot contain any whitespace and must be unique.
- **Downlink Route All Available Multicast** (***read-only***) – Displays the status of this feature as **Enabled** or **Disabled**.
- **Multicast IP Address** – This address defines the route to the destination network.
- **Next Hop HDLC (Eth to Sat Only) (*read-only*)** – Displays the desired Next Hop HDLC IP Address for traffic to be sent over the satellite, within the following ranges:
  - Point-to-Point: No HDLC address
  - Small Network: 0x1 – 0xFE
  - Large Network: 0x1 – 0xFFFE
- **Sat to Eth** – Select the valid packet handling value for routing to a destination network, using the associated drop-down:
  - **Forward –** Multicast is only forwarded across link if both units have this feature enabled.

- **Filter –** A multicast packet is received but there is no application associated with it.

- **Add/Change:** Click to add a Multicast Route Entry to the Multicast Route Table or modify an existing table entry. The entry will be added to the table (or the existing entry modified) for processing once the user clicks **[Submit]**.
- **Delete:** Click to flag a Multicast Route Entry for removal from the Multicast Route Table. The entry will be deleted from the table once the user clicks **[Submit]**.

Once the desired settings have been configured, click [**Submit]** to save those changes.

Multicast Route Table

This *read-only* window displays the currently active Multicast Route Table entries.

8.2.5.5 IP | ARP

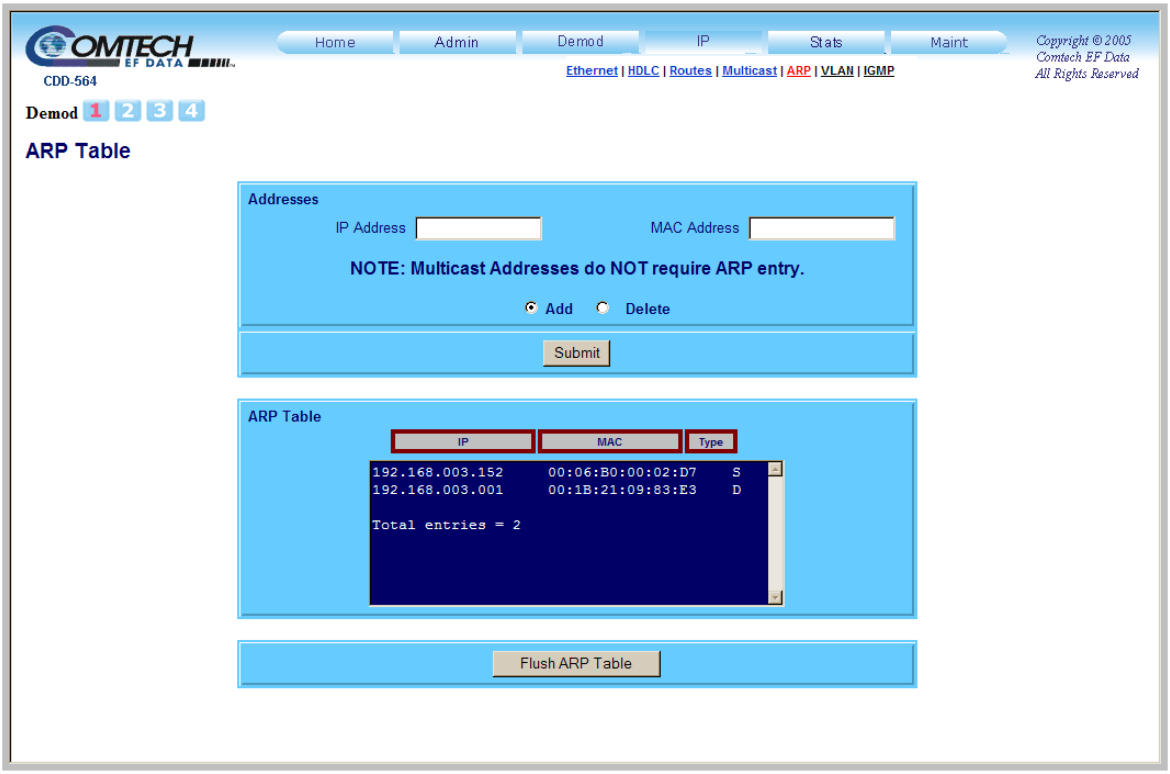


Figure 8-19. IP | ARP page

Use the '**IP | ARP'** page (**Figure 8-19)** to display all current ARP entries (both Static and Dynamic). The user is able to directly edit any of the current static ARP entries.

Addresses

- **IP Address:** Enter the IP Address (format XXX.XXX.XXX.XXX).
- **MAC Address:** Enter the MAC Address (format YY:YY:YY:YY:YY:YY).
- Click **Add** to directly add a Static ARP entry. The entry will be added to the ARP Table for processing once the user clicks **[Submit]**.
- Click **Delete** to flag a Static ARP entry for removal from the ARP Table. The ARP entry will be deleted from the ARP Table once the user clicks **[Submit]**.

Once the desired ARP values have been entered, click [**Submit]** to save those changes.

ARP Table

This *read-only* table list the ARP entries by IP address, MAC address, and entry Type (S=Static; D=Dynamic).

Click **[Flush ARP Table]** to update the table (note that the index total will automatically increment to the next available number).

8.2.5.6 IP | VLAN

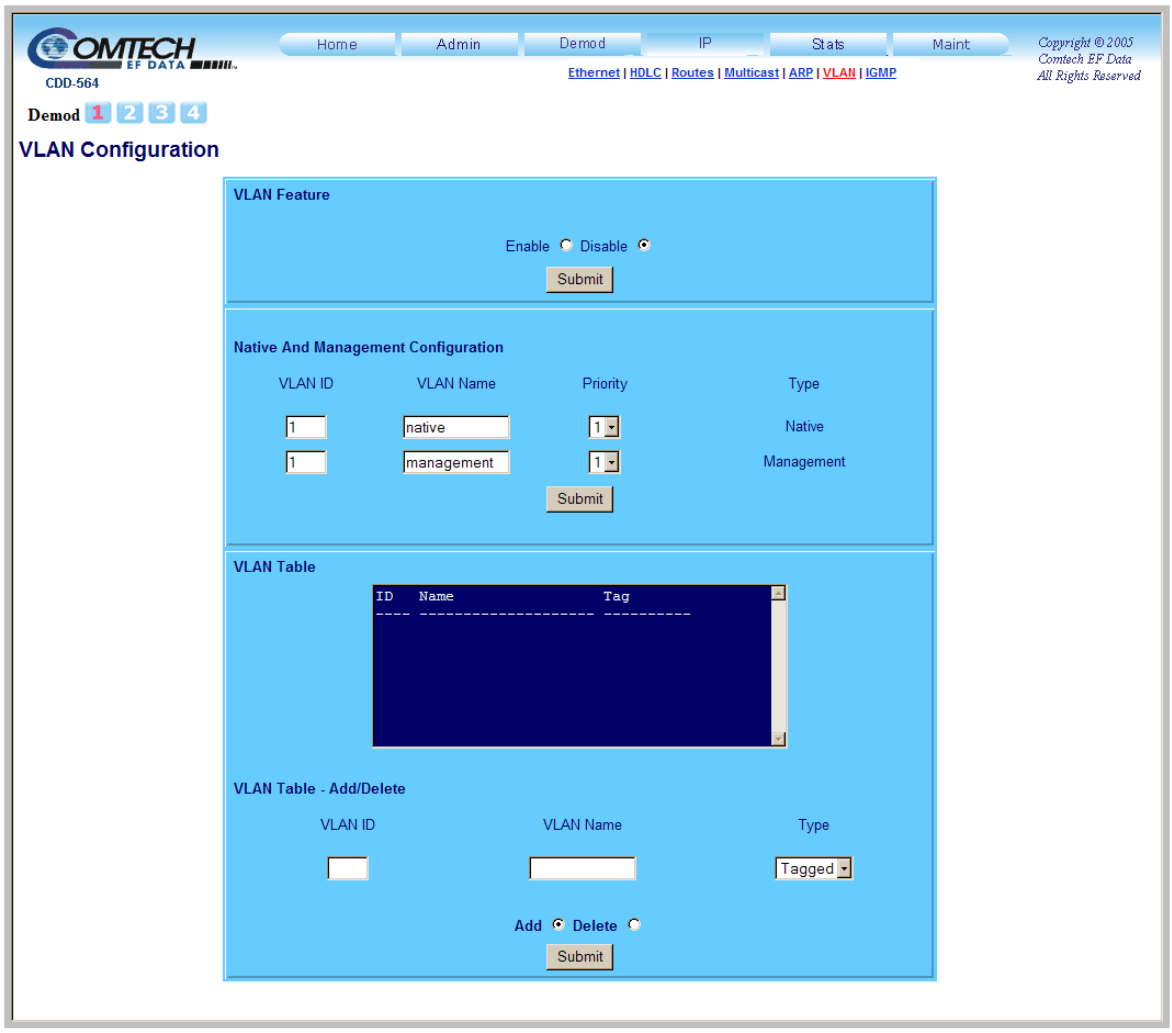


Figure 8-20. IP | VLAN page

Use the '**IP | VLAN'** page (**Figure 8-20**) on a per-Demod basis when *HDLC Address Mode* has been set to **Managed Switch** (see '**IP | HDLC**').

VLAN Feature

Use the option buttons to **Enable** or **Disable** VLAN operation. Click **[Submit]** once the selection has been made.

Native and Management Configuration

This section is used to configure the *Native* and *Management* VLAN IDs:

- The *Native* VLAN ID is used to tag arriving packets that have no VLAN tag. Likewise, when packets arrive from the WAN with the same VLAN tag as the Native VLAN ID, then the VLAN header is removed and passed to the LAN interface.

- The *Management* VLAN ID us used to specify a dedicated management VLAN used to access and control the modems.

For either Native or Management VLAN ID configuration, enter the following information:

- **VLAN ID:** Specifiy a value from **1** to **4095**.
- **VLAN Name:** Assign a string to label the VLAN ID as needed for user convenience.
- **Priority:** Use the drop-down list box to select prioritize rules from **0** to **7**.

Once the desired information has been entered, click [**Submit]** to save those changes.

VLAN Table

This *read-only* table list the VLAN rules by ID, Name, and Tag.

VLAN Table – Add/Delete

- **VLAN ID:** Enter an ID for the rule. Specifiy a value from **1** to **4095**.
- **VLAN Name:** Enter a name for the rule, using a maximum of 20 characters.
- **Type:** ***Tagged*** is the only rule option available at this time.
- **Add:** Click to add a VLAN priority rule. The entry will be added to the VLAN Table for processing once the user clicks **[Submit]**.
- **Delete:** Click to flag a VLAN priority rule for removal from the VLAN Table. The VLAN rule will be deleted from the VLAN Table once the user clicks **[Submit]**.

Once the desired information has been entered, click [**Submit]** to save those changes.

8.2.5.7 IP | IGMP

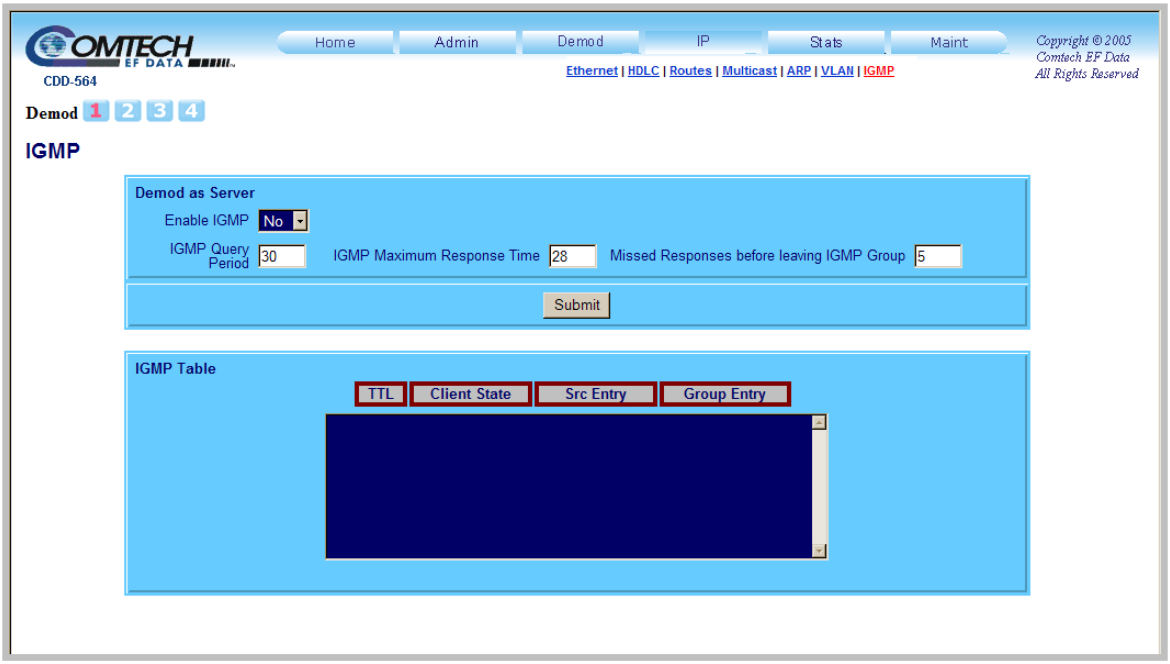


Figure 8-21. IP | IGMP page

Use the '**IP | IGMP'** page (**Figure 8-21)** to facilitate the use of Internet Group Management Protocol (IGMP) with configured multicast routes.

Demod as Server

- **Enable IGMP:** Select **Yes** or **No** using the drop-down list box. If enabled, the IP Module responds to IGMP queries for the configured multicast routes on the transmit side and generates IGMP queries on the receive side.
- **IGMP Query Period:** Enter a query period value from **1** to **600** seconds into the text box.
- **IGMP Maximum Response Time:** Enter a response time value that is *less than the IPGM Query Period* ***minus one*** – from 1 to 598 seconds – into the text box.
- **Missed Responses before leaving IGMP Group:** Enter the number of desired missed responses – from 1 to 30 – into the text box.

IGMP Table

This *read-only* table lists the IGMP Groups that are active on the modem. This includes the Time to Live for the entry; the State (Idle, Active, or Closing); and the Multicast IP Address.

Once the desired settings have been configured on this page, click [**Submit]** to save those changes.

8.2.6 Stats Pages

The hyperlinks available under the '**Stats**' tab provide the user access to ***read-only*** windows reflecting ongoing operational status, operational statistics, and event logging.

8.2.6.1 Stats | Ethernet

COMTECH EF DATA
CDD-564
Home
Admin
Demod
IP
Stats
Maint
Ethernet | IP | WAN
Copyright © 2005 Comtech EF Data All Rights Reserved
Demod 1 2 3 4
Ethernet Statistics
Ethernet Statistics - Automatically Updates Every 10 Seconds
Tx Good Frames 755
Tx Maximum Collision Count 0
Tx Late Collision Count 0
Tx DMA Underrun Error Count 0
Tx Lost Carrier Sense Count 0
Tx Deferred Count 0
Tx Single Collision Count 0
Tx Multiple Collision Count 0
Tx Total Collision Count 0
Tx Flow Control PAUSE Frames Transmitted 0
Rx Good Frames 761
Rx CRC Error Frame Count 0
Rx Alignment Error Count 0
Rx Resource Error Count 0
Rx FIFO Overrun Error Count 0
Rx Collision Detect Error Count (CDT) 0
Rx Runt Frame Count 0
Rx Flow Control PAUSE Frames Received 0
Reset Stats

Figure 8-22. Stats | Ethernet page

Use the '**Stats | Ethernet'** page (**Figure 8-22)** to review ***read-only*** status information pertaining current operating statistics for Ethernet Rx.

Click **[Reset Stats]** to allow the most recent statistics to display; otherwise, this page automatically updates every 10 seconds.

8.2.6.2 Stats | IP

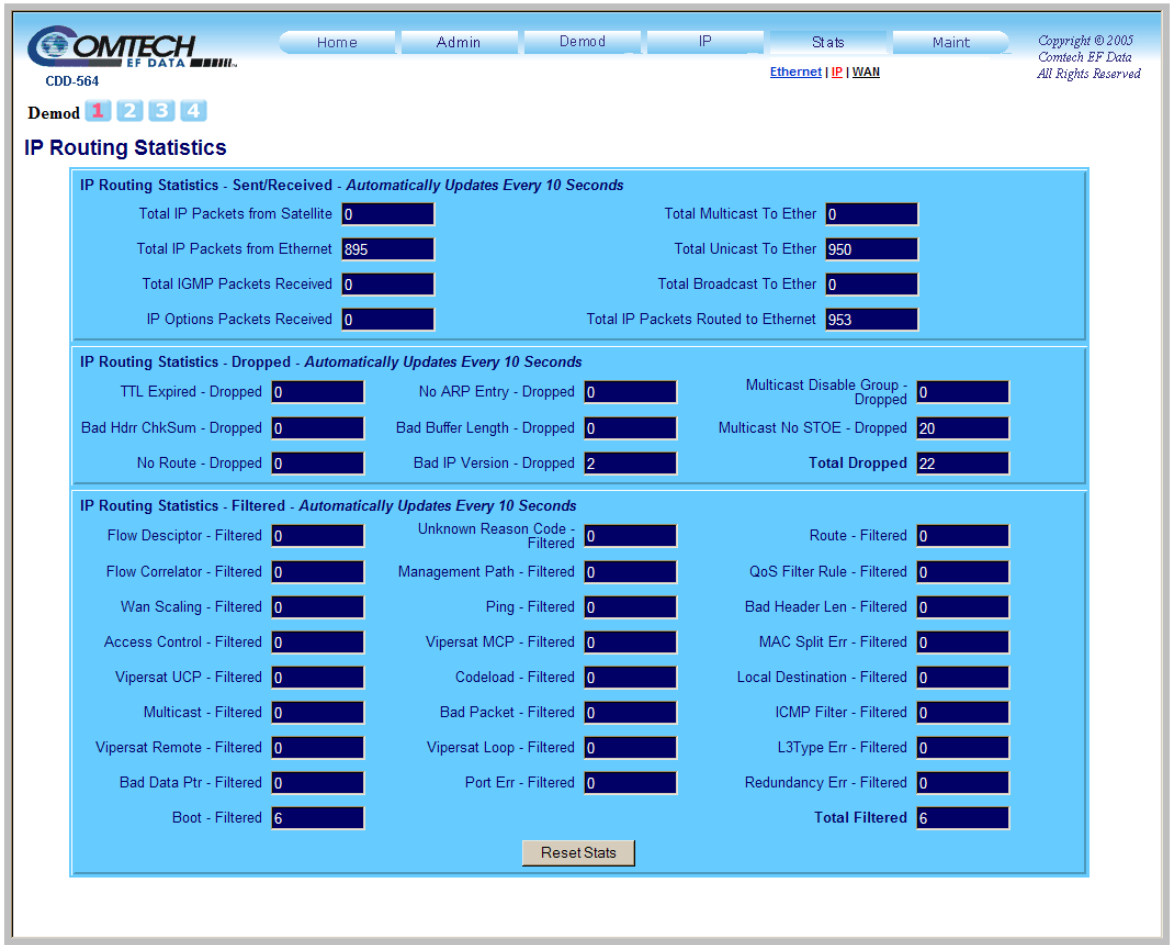

COMTECH EF DATA
CDD-564
Home
Admin
Demod
IP
Stats
Maint
Ethernet | IP | WAN
Copyright © 2005 Comtech EF Data All Rights Reserved
Demod 1 2 3 4
IP Routing Statistics
IP Routing Statistics - Sent/Received - Automatically Updates Every 10 Seconds
Total IP Packets from Satellite 0
Total IP Packets from Ethernet 895
Total IGMP Packets Received 0
IP Options Packets Received 0
Total Multicast To Ether 0
Total Unicast To Ether 950
Total Broadcast To Ether 0
Total IP Packets Routed to Ethernet 953
IP Routing Statistics - Dropped - Automatically Updates Every 10 Seconds
TTL Expired - Dropped 0
Bad Hdrr ChkSum - Dropped 0
No Route - Dropped 0
No ARP Entry - Dropped 0
Bad Buffer Length - Dropped 0
Bad IP Version - Dropped 2
Multicast Disable Group - Dropped 0
Multicast No STOE - Dropped 20
Total Dropped 22
IP Routing Statistics - Filtered - Automatically Updates Every 10 Seconds
Flow Desciptor - Filtered 0
Flow Correlator - Filtered 0
Wan Scaling - Filtered 0
Access Control - Filtered 0
Vipersat UCP - Filtered 0
Multicast - Filtered 0
Vipersat Remote - Filtered 0
Bad Data Ptr - Filtered 0
Boot - Filtered 6
Unknown Reason Code - Filtered 0
Management Path - Filtered 0
Ping - Filtered 0
Vipersat MCP - Filtered 0
Codeload - Filtered 0
Bad Packet - Filtered 0
Vipersat Loop - Filtered 0
Port Err - Filtered 0
Route - Filtered 0
QoS Filter Rule - Filtered 0
Bad Header Len - Filtered 0
MAC Split Err - Filtered 0
Local Destination - Filtered 0
ICMP Filter - Filtered 0
L3Type Err - Filtered 0
Redundancy Err - Filtered 0
Total Filtered 6
Reset Stats

Figure 8-23. Stats | IP page

Use the '**Stats | IP'** page (**Figure 8-23)** to review ***read-only*** status information pertaining to:

Click **[Reset Stats]** to allow the most recent statistics to display; otherwise, this page automatically updates every 10 seconds.

8.2.6.3 Stats | WAN

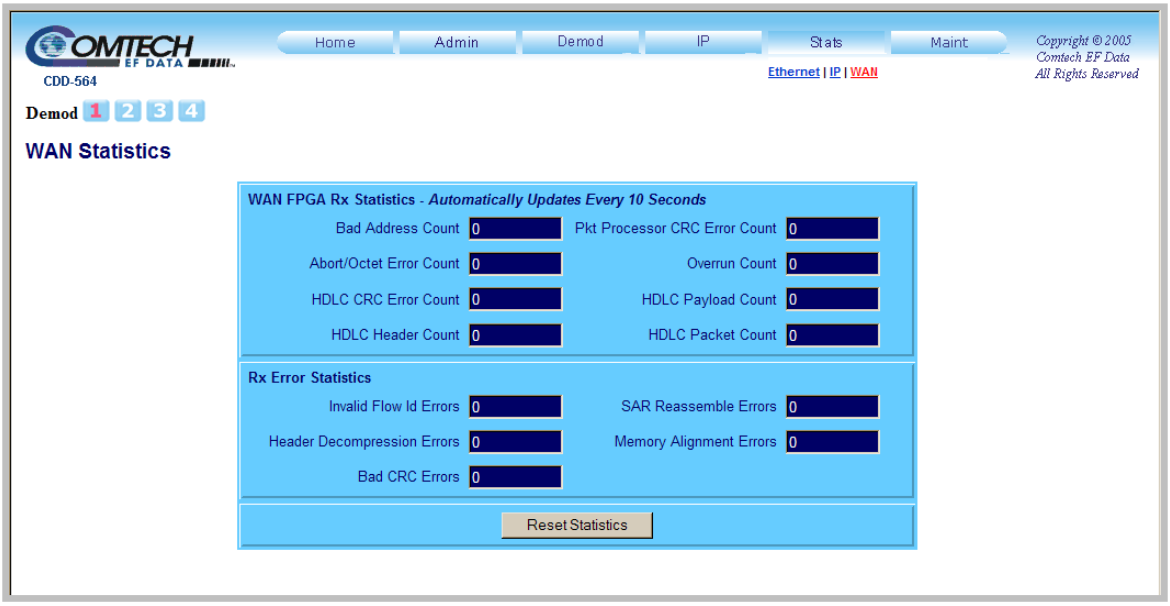


Figure 8-24. Stats | WAN page

Use the '**Stats | WAN'** page (**Figure 8-24)** to review ***read-only*** status information pertaining to current operating statistics for the WAN FPGA Rx, as well as logged Rx Errors.

Click **[Reset Statistics]** to allow the most recent statistics to display; otherwise, this page automatically updates every 10 seconds.

8.2.7 Maint (Maintenance) Pages

8.2.7.1 Maint | Unit Info

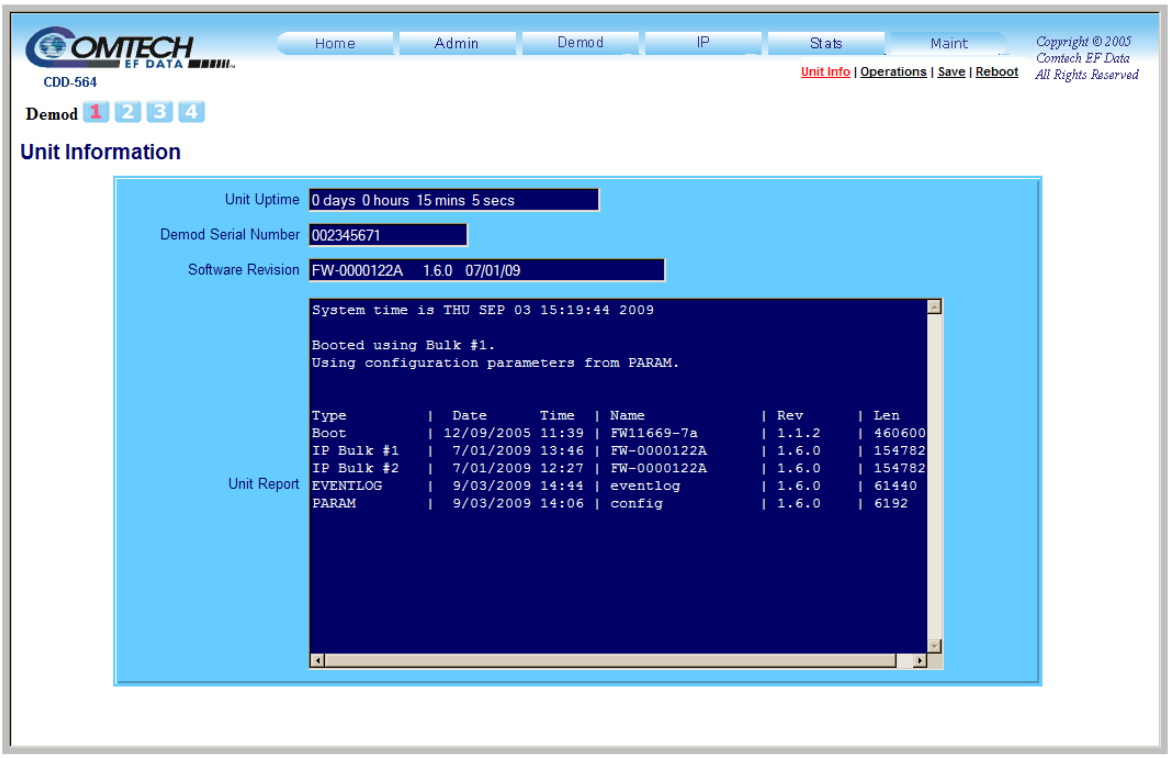

COMTECH EF DATA
CDD-564
Home
Admin
Demod
IP
Stats
Maint
Unit Info | Operations | Save | Reboot
Copyright © 2005
Comtech EF Data
All Rights Reserved
Demod 1 2 3 4
Unit Information
Unit Uptime
0 days 0 hours 15 mins 5 secs
Demod Serial Number
002345671
Software Revision
FW-0000122A 1.6.0 07/01/09
Unit Report
System time is THU SEP 03 15:19:44 2009
Booted using Bulk #1.
Using configuration parameters from PARAM.
Type | Date Time | Name | Rev | Len
Boot | 12/09/2005 11:39 | FW11669-7a | 1.1.2 | 460600
IP Bulk #1 | 7/01/2009 13:46 | FW-0000122A | 1.6.0 | 154782
IP Bulk #2 | 7/01/2009 12:27 | FW-0000122A | 1.6.0 | 154782
EVENTLOG | 9/03/2009 14:44 | eventlog | 1.6.0 | 61440
PARAM | 9/03/2009 14:06 | config | 1.6.0 | 6192

Figure 8-25. Maint | Unit Info page

Use the '**Maint | Unit Info'** page (**Figure 8-25)** to review ***read-only*** status information pertaining to the base unit and IP Module's firmware information for Boot, Active and Inactive Bulks. The Unit Uptime, Modem Serial number, and IP Module Software Revision information is also provided here.

For details about the information provided on this page, refer to **Chapter 5. FRONT PANEL OPERATION.**

8.2.7.2 Maint | Operations

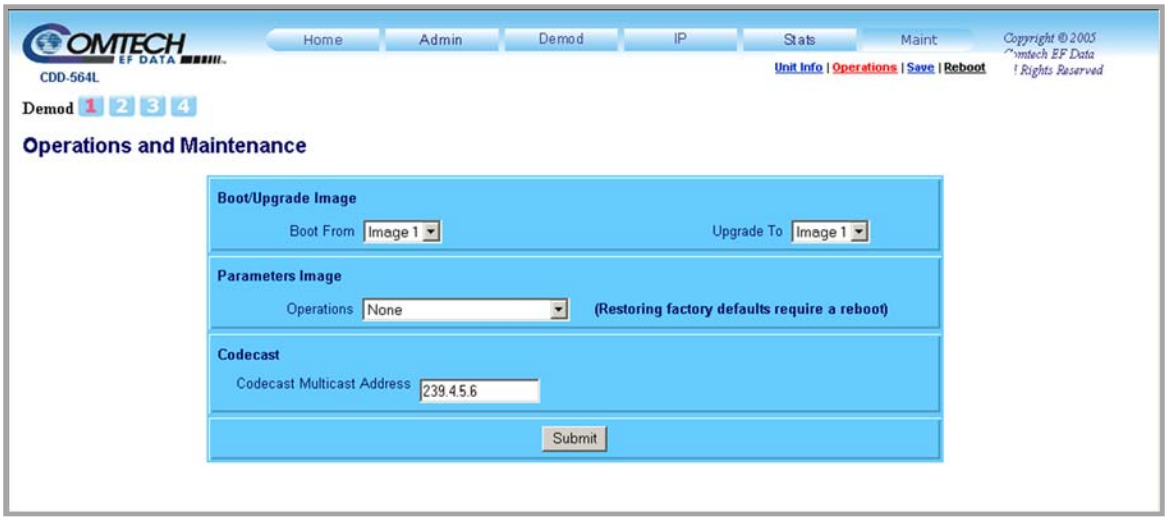


Figure 8-26. Maint | Operations page

Use the '**Maint | Operations'** page (**Figure 8-26)** to configure the unit's handling of firmware upon boot-up:

Boot/Upgrade Image

- **Boot From:** Determines which firmware version (includes Application, FPGA, and FFPGA) will be loaded upon boot-up. Using the drop-down menu, click on **Latest** (boots the newest firmware load based upon date), **Image1** (boots the firmware loaded into the first slot in permanent storage), or **Image2** (boots the firmware loaded into the second slot in permanent storage).
- **Upgrade To:** Determines which installed firmware (includes Application, FPGA, and FFPGA) that the demodulator will overwrite when upgrading with a new firmware download. Using the drop-down menu, click on **Oldest** (overwrites the oldest firmware based upon date), **Image1** (overwrites the firmware loaded into the first slot in permanent storage), or **Image2** (overwrites the firmware loaded into the second slot in permanent storage).

Parameter Image

Using the drop-down menu, select one of the following:

- **None** – No deviation from the parameter currently saved to Flash.
- **Save Parameters to Flash** – When changes are made to the demodulator's parameters, the **'Maint | Save'** page must be selected in order for these settings to be valid through a power cycle. Without using this option, settings will revert back to their previous state as indicated by the last time changes were saved to Flash memory.
- **Load Parameters from Flash** – Reloads the parameters from Flash memory. This may overwrite changes that have not yet been saved to Flash memory.
- **Restore Factory Defaults** – uses the internal, hard-coded factory default parameters.

  Note: Restoring the factory default configuration requires a system reboot.

Codecast

Set the *Codecast Multicast Address* used to upgrade the Software Packages using Vload.

Once the desired settings have been made, click **[Submit]** as needed to save those changes.

8.2.7.3 Maint | Save

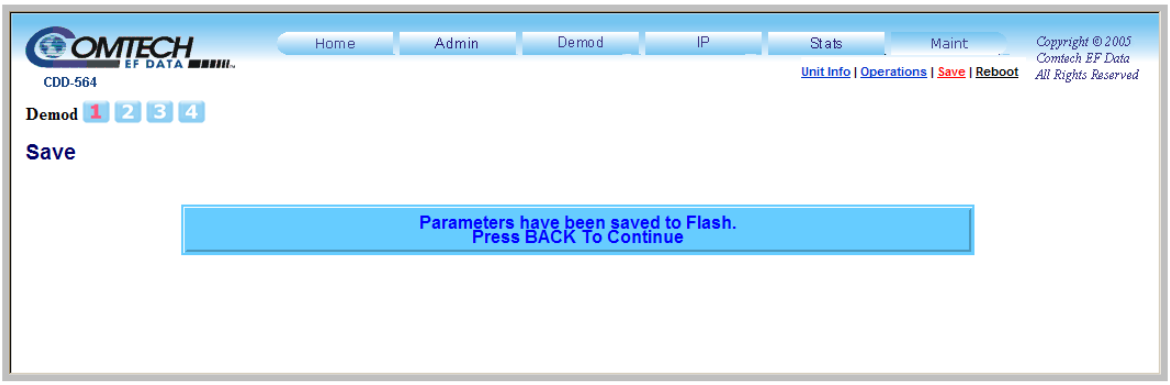


Figure 8-27. Maint | Save page

By clicking on the '**Maint | Save'** page (**Figure 8-27)** hyperlink, all configuration changes made to the demodulator and IP paramaters are stored to Flash memory, thereby making all configuration changes made via the Web Server Interface permanent until the user either initiates and saves a new round of settings updates, or restores all settings to the original factory defaults via the **'Maint | Operations'** page.

IMPORTANT

Any changes made to the demodulators will be lost upon reset or power loss unless the changes are saved to permanent storage. This applies to all of the demodulator and IP parameters.

Press the Backspace key (**[Back ←]**) on the keyboard or select any other page tab or hyperlink to continue using other features of the Web Server Interface.

8.2.7.4 Maint | Reboot

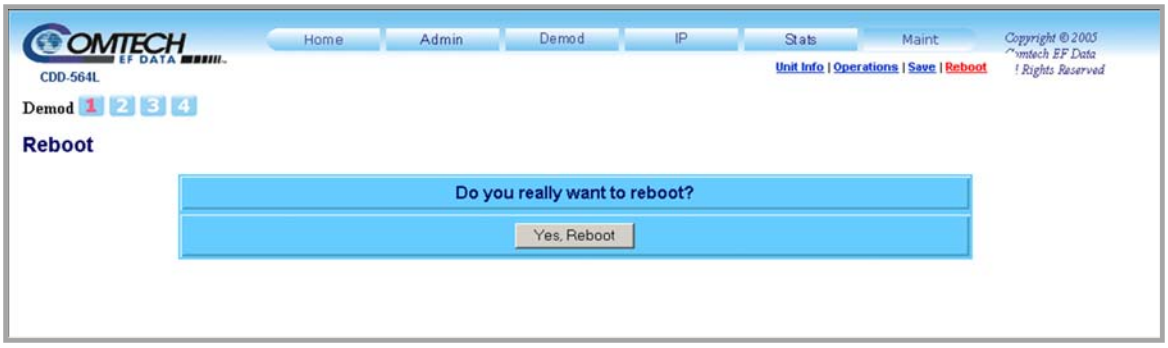


Figure 8-28. Maint | Reboot page

Use the '**Maint | Reboot'** page (**Figure 8-28)** to force the demodulator to reboot. In response to the displayed prompt, click **[Yes, Reboot]** to execute reboot of the unit.

IMPORTANT

Rebooting the unit does not remove the web browser's name/password cookie. It is therefore recommended, after clicking* [Yes, Reboot] *that the user close the Web Browser in order to delete the demodulator's security cookie.

Notes:

Appendix A. QUICK START GUIDE

A.1 Introduction

This appendix illustrates how to quickly configure a pair of CDM-570/570L or similar Comtech EF Data IP-compatible modems (referred to hereafter as the **CDM-IP** modems) using a CDD-56X as the demodulator.

By following this Quick Start Guide, the user – beginning with the factory default settings – may be able to pass traffic within a matter of minutes.

IMPORTANT

This document assumes that the user is familiar with the configuration and the operation of both the CDM-IP modem and the CDD-56x demodulator.

A.2 Getting Started

A.2.1 Equipment List

Item	Description	Qty	Comments
1	a) CDM-IP modems (e.g., CDM-IP550, CDM-IP300L, CDM-570/470L w/IP Module, etc.) b) CDD564/564L/562L Demodulator	2 1	Depending upon the modems used, the user may need to provide equipment to convert 70 MHz IF to L-Band for a duplex connection.
2	10/100 BaseT Ethernet Hub	2	Provided by user. **Notes**: 1. Only 10BaseT operation is supported in easyConnect™ mode. 2. RJ-45 crossover Ethernet cables can be substituted to directly connect PC to CDM-IP modem without the use of a hub.
3	PC equipped with network interface card and terminal emulation program (e.g., HyperTerminal)	2	Provided by user.
4	Console cable (DB-9 to RJ-11)	1	Supplied by Comtech EF Data.
5	CAT5 Ethernet cables	4	Provided by user.
6	IF cables	2	Provided by user to interconnect Tx/Rx between both CDM-IP modems.

A.2.2 Basic Equipment Setup

*Referring to an equipment setup as illustrated in **Figure A-2** in Sect. A.3 of this appendix:*

Step	Description
1	Connect CDM-IP 1 and Demodulator 3 to PC1 via 10/100 BaseT Ethernet Hub 1 and CDM-IP 2 to PC2 via 10/100 BaseT Ethernet Hub 2
2	Connect the TX IF on CDM-IP 1 to RX IF of CDM-IP 2, and Tx IF on CDM-IP 2 to the RX1 IF of the CDD-56X [RX-1 First Demodulator].
3	Connect the DB-9 end of the console cable to the COM1 or COM2 port of the PC, and the RJ-11 end to the console port at the back of CDM-IP 1.
4	Connect CDM-IP 1, CDM-IP 2, and Demodulator 3 to a suitable power supply and turn all units **ON**.

A.2.3 Transmit and Receive IF Configuration

Step	Description
1	Configure the transmit and receive IF parameters for CDM-IP 1, CDM-IP 2, and the CDD-56X Demodulator 3 via the modem front panel. **Note:** The IF parameters can also be set via console menu, Telnet, Web interface, or SNMP, but for this exercise it is recommended that the front panel be used.
2	Set the **TxPower** to minimum level.
3	Before proceeding to next step, make sure that CDM-IP 1 is appropriately carrier-locked to CDM-IP 2, and CDM-IP 2 to CDD-56X Demodulator 3.

A.2.4 Serial Console Port Command Line Interface (CLI) Configuration

Step	Description
1	Launch the terminal emulation program (e.g., HyperTerminal) via Microsoft Windows.
2	Select the appropriate COM port (i.e., the port to which the DB-9 end of the console cable is connected) and configure it for: ▸ 38,400 bps ▸ 8 data bits ▸ No parity ▸ 1 stop bit ▸ No hardware flow control
3	Press **Enter** to first log onto, then bring up the CLI Main Menu as depicted in **Figure A-1** via either the Telnet or HyperTerminal interfaces. To use the CLI, select the appropriate submenu or command entry by pressing the character indicated at the right. For either interface, enter [**X]** to return to the previous menu. **Note**: Any CDM-IP configuration changes need to be saved by selecting, from any menu screen, [**S**] **(Save Parameters to permanent storage),** then typing [**y**] to save.

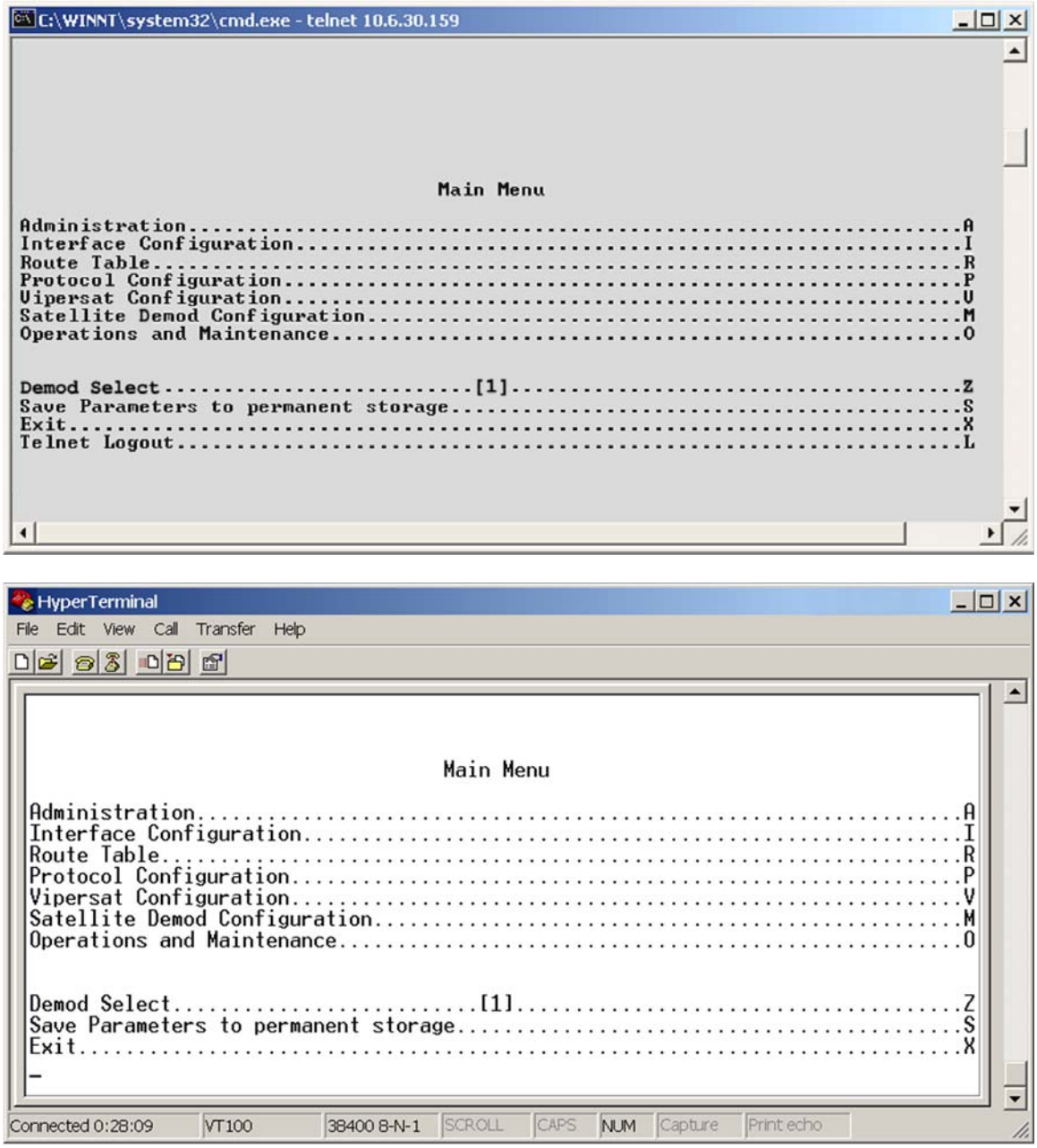


Figure A-1. Main Menu via Telnet or HyperTerminal (CDD-56X shown)

A.2.5 Restoring Factory Default Configuration

The remaining sections in this appendix assume that the CDM-IP is still in factory default configuration for IP. If this is not the case, the factory default configuration may be restored from the menu as follows:

Step	Description
1	From the **Main Menu,** select the **Operations and Maintenance** submenu [**O**].
2	From the **Operations and Maintenance** submenu, select **Database Operations** submenu [**D**].
3	From the **Database Operations** menu, select **Restore Factory Default** option [**R**].
4	When the following prompt is displayed: **`Are you sure you want to restore factory default settings?`** **`WARNING: Choosing Yes will restore factory defaults and then reboot..`** Confirm restore, when prompted, by typing **[y]** (yes).

By completing the above procedure, this erases any user configurations made to date and restores the CDD-56X to its factory default configuration.

Proceed to Section A.3 to perform the Router Mode configuration.

A.3 Router Mode – Point-to-Point System Configuration

The steps in this section are used to establish a Router Mode Point-to-Point System Configuration. Note that all steps outlined in the subsections that follow refer back to **Figure A-2**.

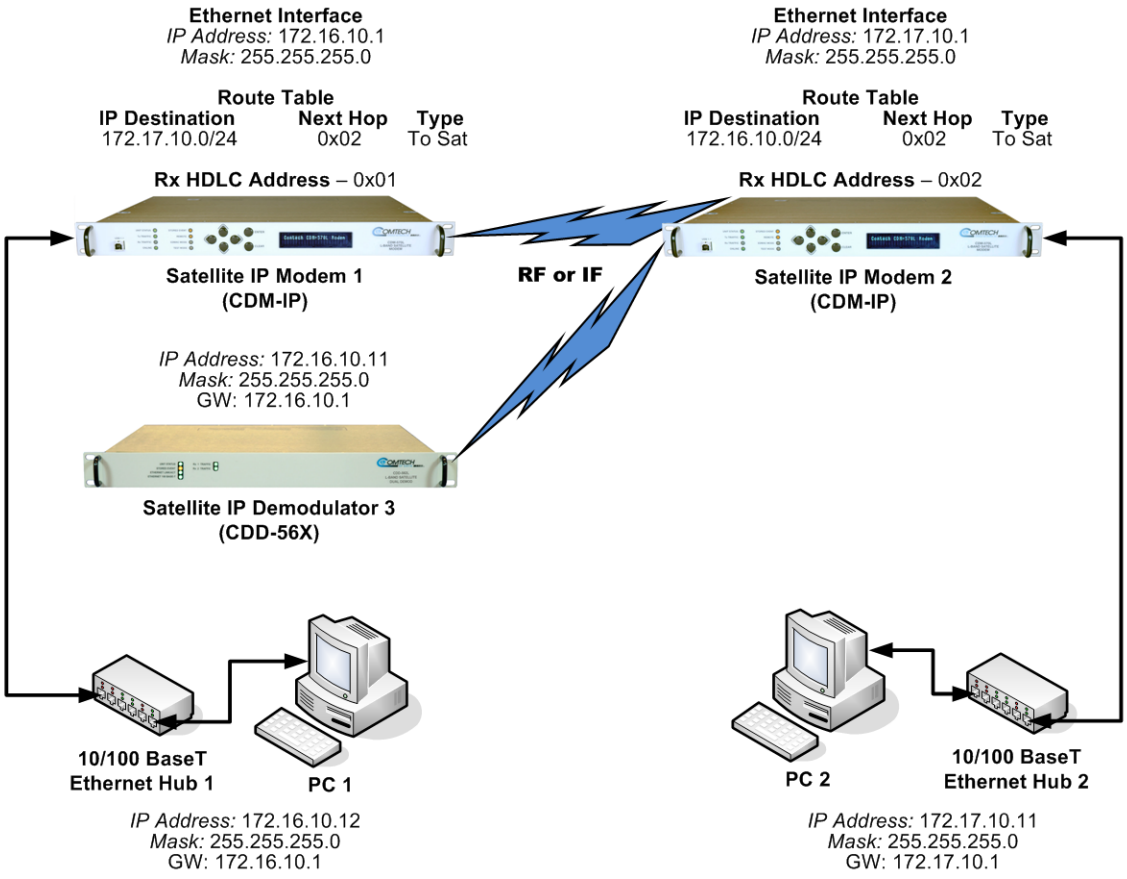


Figure A-2. Router Mode Point-to-Point System Configuration

A.3.1 PC Configuration

Step	Description
1	Set the IP address on **PC1** to **172.16.10.11**; Set Mask to **255.255.255.0**; Set PC Gateway to **172.16.10.1.**
2	Set the IP address on **PC2** to **172.17.10.11**; Set Mask to **255.255.255.0**; Set PC Gateway to **172.17.10.1.**
3	Reboot the PCs (if required).

A.3.2 Set CDM-IP Modems to Router Mode Operation

Perform the following steps on **Satellite Modems (CDM-IP) 1 and (CDM-IP) 2**:

Step	Description
1	***Beginning with the CDM-IP 1 modem:*** From the CLI **Main Menu,** select the **Administration [A]** submenu.
2	From the **Administration** submenu, select **CDM-IP Working Mode [C]**.

3	Select [**1**] for **Router Mode – Small Network Mode**.
	When the following prompt is displayed:
	`Changing Modem working mode requires system Reboot.`
	`Do you want to continue(Y/N)[Enter :No]`
	Confirm, when prompted, by typing **[y]** (yes).

4	Allow CDM-IP to reboot then, from the CLI **Main Menu** select **Interface Configuration [I]**.
5	From the **Interface Configuration** submenu, select **Receive HDLC Channel Addresses [H]**.

6	From the **Receive HDLC Channel Addresses** submenu, select **[1]** for **HDLC Addr 1**.
	When the following prompt is displayed:
	`Please enter a value for the HDLC Addr 1`
	`Press ESC to abort`
	`HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0001>:`
	Enter **[1]** to set **HDLC Addr 1** to **0x01**.
	Note: HDLC Addr 1 will display as **0x0001**, although only the last 2 digits are used in **Small Network Mode,** allowing up to 254 separate HDLC addresses.

7	***Continuing to the CDM-IP2 modem:*** For **Satellite Modem (CDM-IP) 2**, repeat **Steps 1-6 –** except – for **Step 6,** set HDLC Addr 1 to 0x02**.**

A.3.3 Set CDD-56X Demodulator to Router Mode Operation

Perform the following steps on **Satellite Demodulator (CDD-56X) 3**:

Step	Description
1	From the CLI **Main Menu,** select the **Administration [A]** submenu.
2	From the **Administration** submenu, select **Working Mode [C]**.

3	When the following prompt is displayed:
	`Changing working mode requires system Reboot.`
	`Do you want to continue(Y/N)[Enter :No]`
	Confirm, when prompted, by typing **[y]** (yes).
	Select **[1]** for **Router Mode – Small Network Mode**.

4	Allow the CDD-56X to reboot then, from the CLI **Main Menu**, select **Interface Configuration [I]**.
5	From the **Interface Configuration** menu, select **Receive HDLC Channel Addresses [H]**.
6	Set "**Demod Select**" to **[1]**.

7	From the **Receive HDLC Channel Addresses** menu, select **[1]** for **HDLC Addr 1**. The following prompt will display:
	`Please enter a value for the HDLC Addr 1`
	`Press ESC to abort`
	`HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0001>:`
	Enter **[1]** to set **HDLC Addr 1** to **0x01**.
	Note: HDLC Addr 1 will display as **0x0001**, although only the last two digits are used in **Small Network Mode,** allowing up to 254 separate HDLC addresses.

Both CDM-IP modems and the CDD56X demodulator are now in **Router/Small Network Mode**, meaning that **CDM-IP 1** & **CDD-56X 3** are on **172.16.10.xxx** subnet, and **CDM-IP 2** is on **172.17.10.xxx subnet**. Modems will be on independent IP subnets and will require adding static routes to pass traffic between them.

The HDLC MAC address is user-configurable.

A.3.4 Set IP Address(es)

Step	Description
1	From the CLI **Main Menu**, select **Network Interface Configuration** submenu **[I]**.
2	From the **Interface Configuration Menu**, select **Ethernet Interface** submenu **[E]**.
3	Select **Ethernet IP Addresses [I]**, then set the addresses as follows: • **CDM-IP 1** to **172.16.10.1** • **CDD-56X** to **172.16.10.2** • **CDM-IP 2** to **172.17.10.1**
4	Set **Ethernet Subnet MaskSubnet Prefix Length [M]** to **24.**

A.3.5 Set IP Stack DES Select Key to ClearRoute Table

First, perform the following steps on **Satellite Modem (CDM-IP) 1:**

Step	Description
1	From the CLI **Main Menu**, select the **Route Table [R]** submenu.
2	Enter '**1**' to configure the first route.
3	Enter a suitable name (e.g., '**test**').
4	Set **IP Address** to '**172.17.10.0**'.
5	Set **Number of Subnet Bits** to '**24**'**.**
6	For **Interface to which route is destined to <E-Ethernet S-Satellite Enter : S>** select '**S**'**.**
7	For **HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0000>:** select '**2**'**.**

8	Per this example, the CDM-IP 1 Route Table should now display the following:
	`Route Name Dest IP/SNet Bits Next Hop MultiCast State`
	`Route001...[test 172.17.10.0/24 0x2 N/A toSat]..1`

9	Go to "**Per Route**" by pressing **[E]**, then *disable* 'HdrCompression', 'PayloadCompression' and '3xDES' by selecting '**No**' ('**Clear**' for 3xDES) for each of these choices.

Next, perform the following steps on **Satellite Modem (CDM-IP) 2:**

Step	Description
1	From the CLI **Main Menu**, select the **Route Table [R]** submenu.
2	Enter '**1**' to configure the first route.
3	Enter a suitable name (e.g., '**test**')
4	Set **IP Address** to '**172.16.10.0'**
5	Set **Number of Subnet Bits** to '**24**'**.**
6	For **Interface to which route is destined to <E-Ethernet S-Satellite Enter : S>** select '**S**'**.**
7	For **HDLC address [SMALL NETWORK] in hex <0x1 - 0xFE, enter = 0000>:** select '**1**'**.**

8	Per this example, the CDM-IP 2 Route Table should now display the following:
	`Route Name Dest IP/SNet Bits Next Hop MultiCast State`
	`Route001...[test 172.16.10.0/24 0x1 N/A toSat]..1`

9	Go to "**Per Route**" by pressing **[E]**, then *disable* 'HdrCompression', 'PayloadCompression' and '3xDES' by selecting '**No**' ('**Clear**' for 3xDES) for each of these choices.

Finally, perform the following steps on the **Satellite IP Demodulator (CDD-56X) 3:**

Step	Description
1	From the CLI **Main Menu**, select the **Route Table [R]** submenu.
2	Enter '**1**' to configure the first route.
3	Enter a suitable name (e.g., '**ToCDMIP2**').
4	Set **IP Address** to '**172.17.10.0**'.
5	Set **Number of Subnet Bits** to '**24**'.
6	For **Interface to which route is destined to <E-Ethernet S-Satellite Enter : S>** select '**E**'.
7	Set the **Next-hop IP Address** to **'172.16.10.1**'.

8	Per this example, the CDD-56X 3 Route Table should now display the following:
	`Route Name  Dest IP/SNet Bits       Next Hop    MultiCast State`
	`Route001...[ToCDMIP2 172.17.10.0/24 172.16.10.1 N/A toEth]..1`

9	If the **Header Compression Feature** is available on this demodulator, do the following: From the CLI **Main Menu,** select **Administration [A]** → **Features Configuration [F]** → **RxHeaderCompression [H]**, then press '**1**' to *disable* the Header Compression on '**Demod 1**'.

At this point the basic configuration is over and the user should be able to:

- Ping **PC1** from **PC2** and vice versa;
- Ping **CDM-IP 2** from **PC1** and vice versa;
- Pass any other data between **PC1** and **PC2**:

  ► ***From PC1:***

  - Ping 172.16.10.1 (**CDM-IP 1**)
  - Ping 172.16.10.2 (**CDD-56X 3**)
  - Ping 172.17.10.2 (**CDM-IP 2**)
  - Ping 172.17.10.11 (**PC2**)

  ► ***From PC2:***

  - Ping 172.17.10.1 (**CDM-IP 2**)
  - Ping 172.16.10.1 (**CDM-IP 1**)
  - Ping 172.16.10.2 (**CDD-56X 3**)
  - Ping 172.16.10.11 (**PC1**)

A.4 Troubleshooting the IP Module

The CDM-IP & CDD-56X come with a variety of diagnostic tools to aid in identifying the traffic path going into and out of the modems. This section shows how to use some of these troubleshooting tools, and additionally identifies several common problems encountered when first setting up two CDM-IP modems.

If following these troubleshooting steps fails to resolve the problem, contact a User Support representative at:

Comtech EF Data
Attention: User Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data Number)
480.333.4357 (User Support Desk)
480.333.2161 FAX

Alternately, E-mail can be sent to the User Support Department at:

cdmipsupport@comtechefdata.com

A.4.1 Router Mode Troubleshooting

Use the following troubleshooting steps if unable to successfully send traffic in Router Mode.

Router Mode Troubleshooting		
Step	**Problem**	**Action**
1	No Ping response from the locally connected PC to the CDM-IP/CDD-56X Ethernet port. ICMP response is: '**`Request timed out`**'.	a) Verify correct IP address/subnet on PC and CDM-IP/CDD-56X. b) Verify Ethernet connection – cables, hub, etc. PC, hub, and CDM-IP/CDD-564L should have Ethernet activity LED lit. **Note:** A PC must be connected to the CDM-IP using a hub, switch or a RJ45 crossover cable. When the CDM-IP/CDD-56X Ethernet port senses an Ethernet connection, the CLI displays: **`Ethernet Interface UP`** If the connection is broken, the CLI displays: **`Ethernet Interface DOWN`**
2	No Ping response from **PC1** to **PC2** or vice versa. ICMP response is: '**`Reply from 172.XXX.10.1 - Destination net unreachable`**'	a) Verify CDM-IP, CDD-564L Route Tables are correct. b) Verify the *hdrcomp* and *decomp* both are either enabled or disabled. **Note:** Go to the Route Table, then Options page to verify *hdrcomp* is **enabled** or **disabled**. On the remote modem, go the main menu, press 'A' Administration, and 'F' for Feature; *hdrdecomp* should be same as *hdrcomp* (i.e., both should either be **enabled** or **disabled**).

Appendix B. E_b/N_0 MEASUREMENT

Although the CDD-56X Satellite Demodulator calculates and makes the value of receive E_b/N_0 available through the remote port of the unit, it is sometimes useful to measure the value using a spectrum analyzer, if one is available.

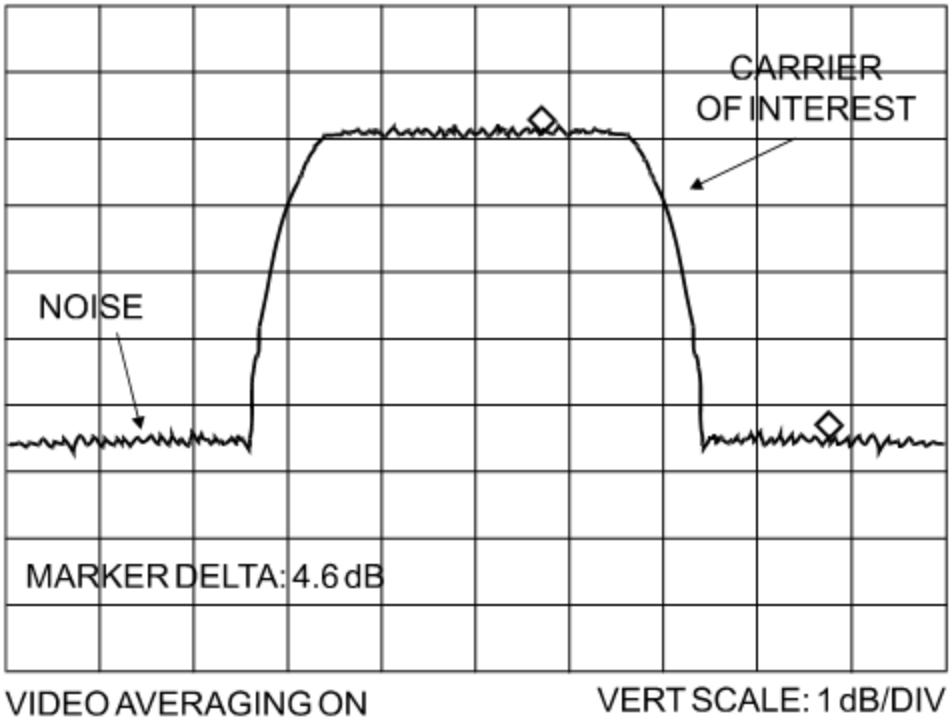
The idea is to accurately measure the value of (Co+No)/No, (Carrier density + Noise density/Noise density). This is accomplished by tuning the center frequency of the Spectrum analyzer to the signal of interest, and measuring the difference between the peak spectral density of the signal (the flat part of the spectrum shown) and the noise density.

To make this measurement:

- Use a vertical scale of 1 or 2 dB/division.
- Set the Resolution Bandwidth of the Spectrum Analyzer to < 20% of the symbol rate.
- Use video filtering and/or video averaging to reduce the variance in the displayed trace to a low enough level that the difference can be measured to within 0.2 dB.
- Place a marker on the flat part of the signal of interest, then use the MARKER DELTA function to put a second marker on the noise to the side of the carrier. This value is (Co+No)/No, in dB.
- Use this value of (Co+No)/No in the table on the following page to determine the Eb/No. You will need to know the operating mode to read from the appropriate column.
- If the (Co+No)/No value measured does not correspond to an exact table entry, interpolate using the two nearest values.

Note that the accuracy of this method degrades significantly at low values of (Co+No)/No (approximately less than 6 dB).

Example: In the diagram that follows, the (Co+No)/No measured is 4.6 dB. If Rate 1/2 QPSK is being used, this would correspond to an E_b/N_0 of approximately 2.6 dB.



The exact relationship used to derive the table values is as follows:

$$\mathbf{E_b/N_0 = 10 \log_{10} (10^{(Co+No/No)/10} -1) - 10 \log_{10} (FEC\ Code\ Rate) - 10 \log_{10} (bits/symbol)}$$

where:

- E_b/N_0 and (Co+No)/No are expressed in dB
- Bits/symbol = 1 for BPSK
- Bits/symbol = 2 for QPSK
- Bits/symbol = 3 for 8-PSK/8-QAM
- Bits/symbol = 4 for 16-QAM
- Code Rate for ‘uncoded’ = 1
- Pay close attention to the sign of the middle term

(Co+No) /No	Eb/No Uncoded BPSK	Eb/No Rate 1/2 BPSK	Eb/No Rate 21/44 BPSK	Eb/No Rate 5/16 BPSK	Eb/No Uncoded QPSK	Eb/No Rate 1/2 QPSK	Eb/No Rate 3/4 QPSK	Eb/No Rate 7/8 QPSK	Eb/No Rate 0.95 QPSK	Eb/No Rate 2/3 8-PSK	Eb/No Rate 3/4 8-PSK	Eb/No Rate 7/8 8-PSK	Eb/No Rate 0.95 8-PSK	Eb/No Rate 3/4 16-QAM	Eb/No Rate 7/8 16-QAM
1.4	-	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-
1.6	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-
1.8	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-
2.0	-	0.7	0.9	2.7	-	-	-	-	-	-	-	-	-	-	-
2.2	-	1.2	1.4	3.2		-	-	-	-	-	-	-	-	-	-
2.4	-	1.7	1.9	3.7	-	-	-	-	-	-	-	-	-	-	-
2.6	-	2.1	2.3	4.2	-	-	-	-	-	-	-	-	-	-	-
2.8	-	2.6	2.8	4.6	-	-	-	-	-	-	-	-	-	-	-
3.0	0.0	3.0	3.2	5.0	-	-	-	-	-	-	-	-	-	-	-
3.5	0.9	3.9	4.1	5.9	-	0.9	-	-	-	-	-	-	-	-	-
4.0	1.8	4.8	5.0	6.8	-	1.8	-	-	-	-	-	-	-	-	-
4.5	2.6	5.6	5.8	7.6	-	2.6	0.8	-	-	-	-	-	-	-	-
5.0	3.3	6.3	6.5	8.4	-	3.3	1.5	0.9	-	-	-	-	-	-	-
5.5	4.1	7.1	7.3	9.1	1.1	4.1	2.3	1.7	1.3	-	-	-	-	-	-
6.0	4.7	7.7	7.9	9.8	1.7	4.7	2.9	2.3	1.9	-	-	-	-	-	-
6.5	5.4	8.4	8.6	10.4	2.4	5.4	3.6	3.0	2.6	-	-	-	-	-	-
7.0	6.0	9.0	9.2	11.1	3.0	6.0	4.2	3.6	3.2	-	-	-	-	-	-
7.5	6.6	9.6	9.8	11.7	3.6	6.6	4.8	4.2	3.8	-	-	-	-	-	-
8.0	7.3	10.3	10.5	12.3	4.3	7.3	5.5	4.9	4.5	-	-	-	-	-	-
8.5	7.8	10.8	11.0	12.9	4.8	7.8	6.0	5.4	5.0	4.8	-	-	-	-	-
9.0	8.4	11.4	11.6	13.4	5.4	8.4	6.6	6.0	5.6	5.4	4.9	-	-	-	-
9.5	9.0	12.0	12.2	14.0	6.0	9.0	7.2	6.6	6.2	6.0	5.5	4.8	4.5	-	-
10.0	9.5	12.5	12.7	14.6	6.5	9.5	7.7	7.1	6.7	6.5	6.0	5.3	5.0	-	-
10.5	10.1	13.1	13.3	15.1	7.1	10.1	8.3	7.7	7.3	7.1	6.6	5.9	5.6	5.3	-
11.0	10.6	13.6	13.8	15.7	7.6	10.6	8.8	8.2	7.8	7.6	7.1	6.4	6.1	5.8	5.2
11.5	11.2	14.2	14.4	16.2	8.2	11.2	9.4	8.8	8.4	8.2	7.7	7.0	6.7	6.4	5.8
12.0	11.7	14.7	14.9	16.7	8.7	11.7	9.9	9.3	8.9	8.7	8.2	7.5	7.2	6.9	6.3
12.5	12.2	15.2	15.4	17.3	9.2	12.2	10.4	9.8	9.4	9.2	8.7	8.0	7.7	7.4	6.8
13.0	12.8	15.8	16.0	17.8	9.8	12.8	11.0	10.4	10.0	9.8	9.3	8.6	8.3	8.0	7.4
13.5	13.3	16.3	16.5	18.3	10.3	13.3	11.5	10.9	10.5	10.3	9.8	9.1	8.8	8.5	7.9
14.0	13.8	16.8	17.0	18.8	10.8	13.8	12.0	11.4	11.0	10.8	10.3	9.6	9.3	9.0	8.4
14.5	14.3	17.3	17.5	19.4	11.3	14.3	12.5	11.9	11.5	11.3	10.8	10.1	9.8	9.5	8.9
15.0	14.9	17.9	18.1	19.9	11.9	14.9	13.1	12.5	12.1	11.9	11.4	10.7	10.4	10.1	9.5
15.5	15.4	18.4	18.6	20.4	12.4	15.4	13.6	13.0	12.6	12.4	11.9	11.2	10.9	10.6	10.0
16.0	15.9	18.9	19.1	20.9	12.9	15.9	14.1	13.5	13.1	12.9	12.4	11.7	11.4	11.1	10.5
16.5	16.4	19.4	19.6	21.4	13.4	16.4	14.6	14.0	13.6	13.4	12.9	12.2	11.9	11.6	11.0
17.0	16.9	19.9	20.1	21.9	13.9	16.9	15.1	14.5	14.1	13.9	13.4	12.7	12.4	12.1	11.5
17.5	17.4	20.4	20.6	22.4	14.4	17.4	15.6	15.0	14.6	14.4	13.9	13.2	12.9	12.6	12.0
18.0	17.9	20.9	21.1	23.0	14.9	17.9	16.1	15.5	15.1	14.9	14.4	13.7	13.4	13.1	12.5
18.5	18.4	21.4	21.6	23.5	15.4	18.4	16.6	16.0	15.6	15.4	14.9	14.2	13.9	13.6	13.0
19.0	18.9	21.9	22.1	24.0	15.9	18.9	17.1	16.5	16.1	15.9	15.4	14.7	14.4	14.1	13.5
19.5	19.5	22.5	22.7	24.5	16.5	19.5	17.7	17.1	16.7	16.5	16.0	15.3	15.0	14.7	14.1
20.0	20.0	23.0	23.2	25.0	17.0	20.0	18.2	17.6	17.2	17.0	16.5	15.8	15.5	15.2	14.6

Notes: IBS Framing: add 0.2 dB EDMAC Framing: rates below 2048 kbps add 0.2 dB, otherwise 0 Reed-Solomon: add an *additional* 0.4 dB to the values shown

Notes:

Appendix C. FAST ACTIVATION PROCEDURE

C.1 Introduction

Fully **A**ccessible **S**ystem **T**opology (FAST) is an enhancement feature available in Comtech EF Data products, enabling on-location upgrade of the operating feature set – in the rack – without removing a demodulator from the setup.

This accelerated upgrade can be accomplished only because of FAST's extensive use of programmable devices incorporating Comtech EF Data-proprietary signal processing techniques. These techniques allow the use of a unique access code to enable configuration of the available hardware.

The access code can be purchased at any time from Comtech EF Data. Once obtained, the access code is loaded into the unit through the console (RJ-11) port on the demodulator rear panel.

C.2 Activation Procedure via Command Line Interface (CLI)

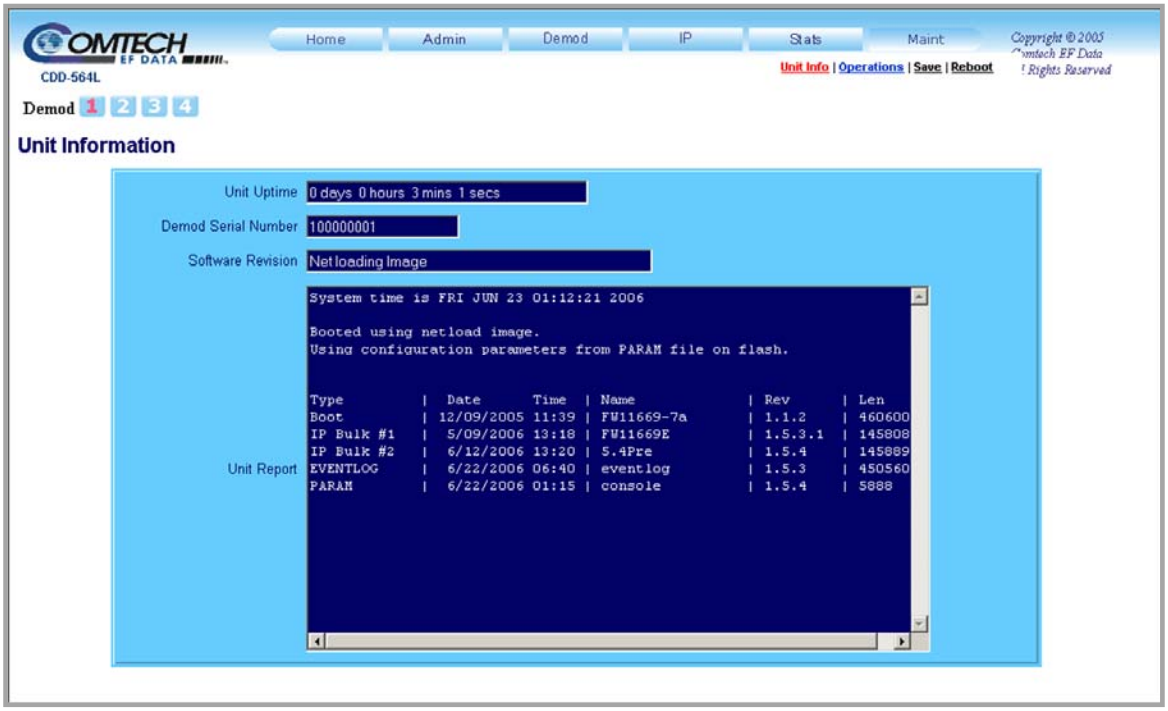
Refer to **Chapter 9. CLI AND TELNET OPERATION** in this manual for information on using the Command Line Interface (CLI) for this procedure.

C.3 Activation Procedure via Web Server Interface

Refer to **Chapter 8. WEB SERVER INTERFACE** for a complete overview on CDD-56X operations via this interface. For the purpose of demonstration, this appendix uses the interface for the CDD-564L Satellite Demodulator with IP Module.

C.3.1 Record Serial Number

The demodulator's serial number may be obtained using the **Maint | Unit Info** page on the Web Server Interface:


COMTECH EF DATA
CDD-564L
Home
Admin
Demod
IP
Stats
Maint
Unit Info | Operations | Save | Reboot
Copyright © 2005 Comtech EF Data All Rights Reserved
Demod 1 2 3 4
Unit Information
Unit Uptime
0 days 0 hours 3 mins 1 secs
Demod Serial Number
100000001
Software Revision
Net loading Image
Unit Report
System time is FRI JUN 23 01:12:21 2006
Booted using netload image.
Using configuration parameters from PARAM file on flash.
Type | Date Time | Name | Rev | Len
Boot | 12/09/2005 11:39 | FW11669-7a | 1.1.2 | 460600
IP Bulk #1 | 5/09/2006 13:18 | FW11669E | 1.5.3.1 | 145808
IP Bulk #2 | 6/12/2006 13:20 | 5.4Pre | 1.5.4 | 145889
EVENTLOG | 6/22/2006 06:40 | eventlog | 1.5.3 | 450560
PARAM | 6/22/2006 01:15 | console | 1.5.4 | 5888

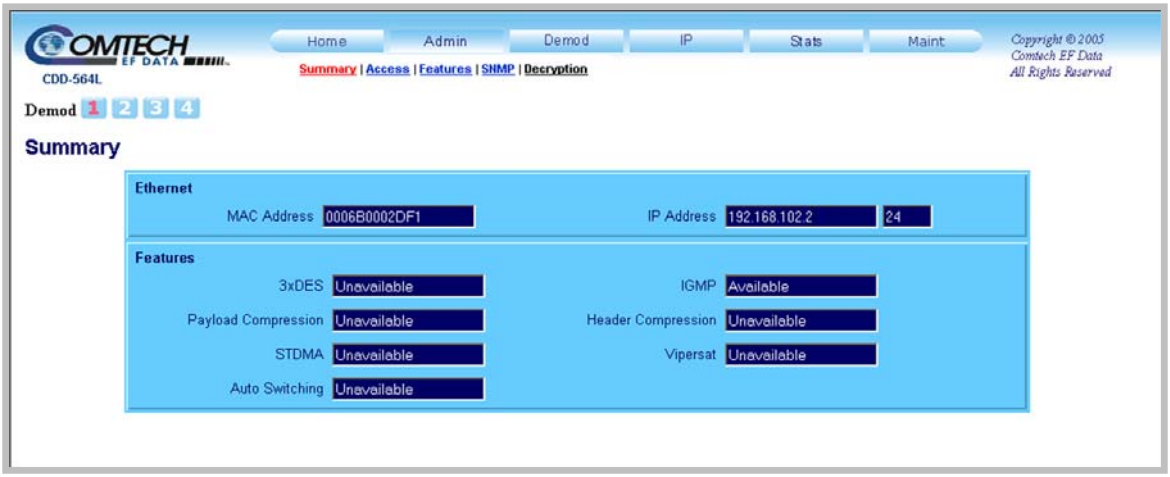
Carefully record the **Demod Serial Number**, as displayed in the field of the same name on this page:

_____

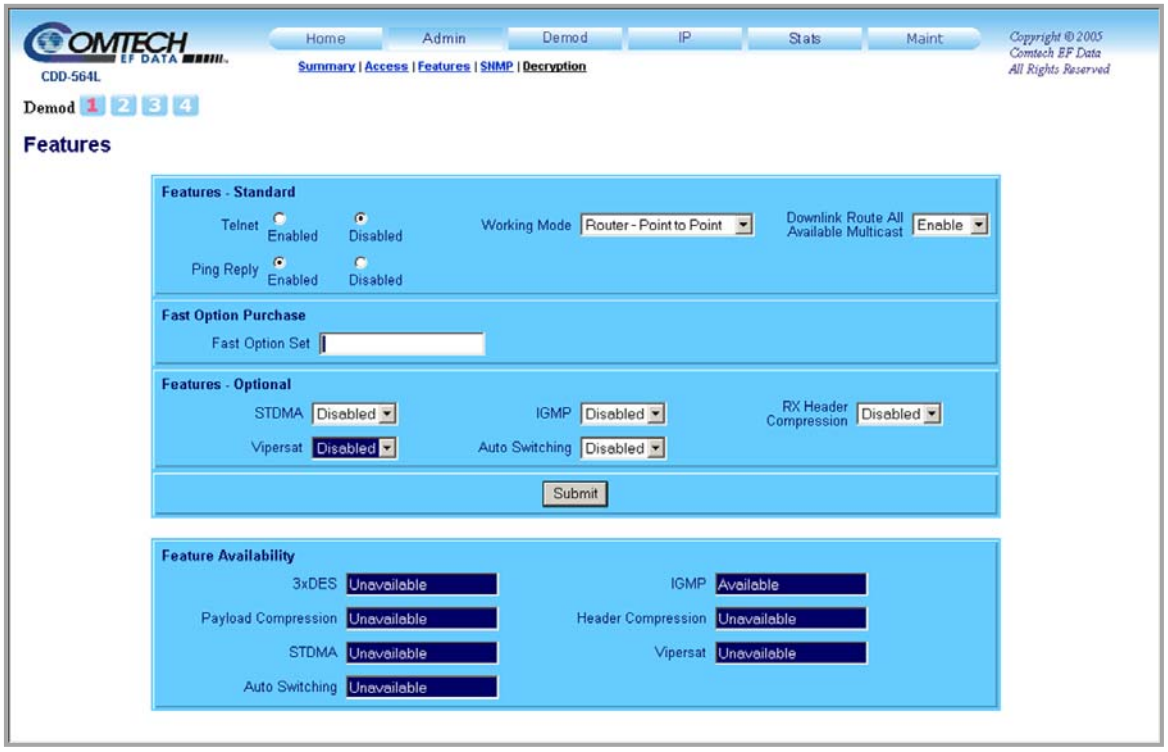
C.3.2 View Currently Installed Features

To view currently installed features, the user may refer to either of the following pages on the Web Server Interface.

*From the **Admin | Summary** page, **Features** section:*



*From the **Admin | Features** page, **Feature Availability** section:*

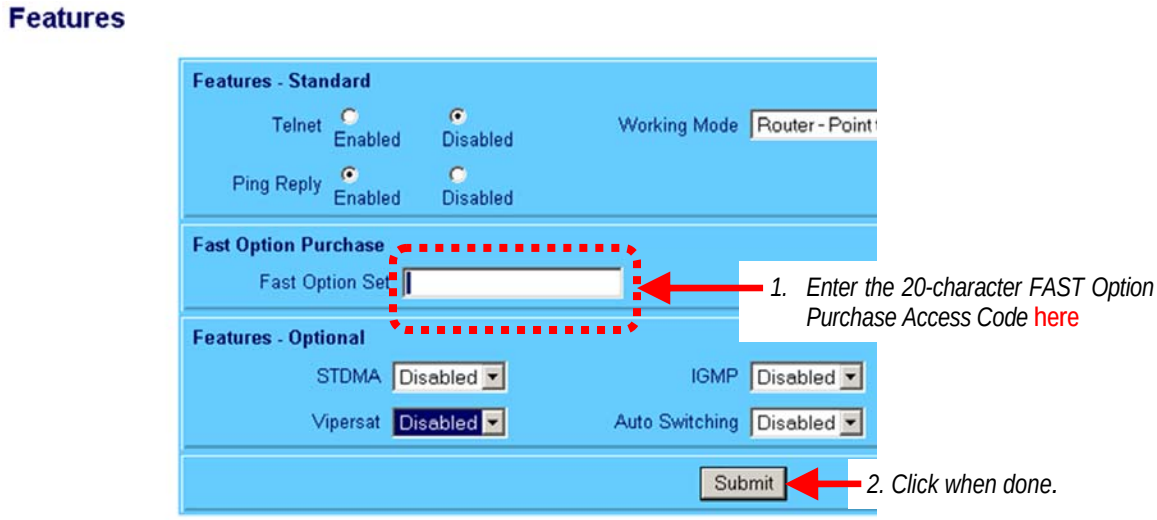


Note that, as shown in the **Features** and **Feature Availability** sections of these pages, any features installed and currently operational are noted as **Available**; conversely, any feature not available/operational (until purchased from Comtech EF Data) is noted as **Unavailable**.

C.3.3 Acquire/Enter FAST Option Purchase Access Code

Contact a Comtech EF Data sales representative to order features, and provide the Modulator Serial Number, as obtained in Sect. C.2.1, when asked. The Comtech EF Data sales representative will verify the order, and Comtech EF Data Customer Support will provide an invoice and FAST option activation instructions (including a 20-character FAST Option code).

Using the **Admin | Features** Web Server Interface page, ***carefully*** enter the 20-character FAST Option code provided by Comtech EF Data into the **FAST Option Set** field (found in the **Fast Option Purchase** section of this page), then click **[Submit]**:



C.3.4 Verify FAST Option Availability

If the FAST Option Purchase Access Code is accepted, the page refreshes once **[Submit]** is clicked and the **Feature Availability** section of this page (as well as the **Features** section of the **Admin | Summary** page) updates accordingly, as per the following example:

Appendix D. CDM/CDD NMCS PROTOCOL, REV 1.0

Date	Rev.	Author	Comments
12/08/05	1.0	Harish Talanki	Created from CDM-570/570L NMCS document.
09/10/09	N/A	CEFD Tech Pubs	Document content reformatted to incorporate Addendum A into CDD-562L/564/564L Installation and Operation Manual as Appendix D.

D.1 Introduction

The scope of this document is to define the interface specification that will be used for a new Remote Control based interface to the CDM/CDD family of products. The primary interface is to be Telnet, however other interfaces may adapt to the **CIM** implementation, programmatically, via specific **API** calls.

D.2 Architecture

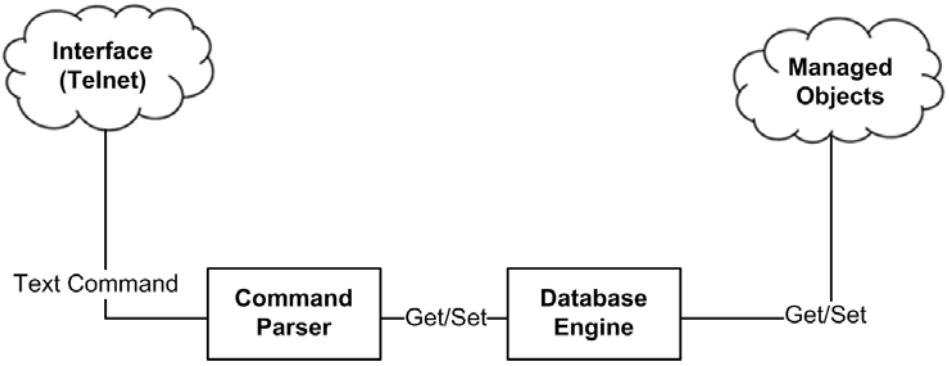


Figure D-1. CDM/CDD NMCS Basic Architecture Layout

The Remote **NMCS** attaches to an external interface, such as Telnet, and processes basic text based commands to the **CiM** database manager. As shown in **Figure D-1**, The database manager is responsible for resolving **GET** and **SET** actions to **Local** and **Remote** objects.

D.3 NMCS Protocol

D.3.1 Overview

The sections that follow outline the basic command set supported in this version of the **CIM NMCS** protocol.

D.3.2 Telnet Interface

Telnet interface into the **NMCS** system must be on port 7023, which has been reserved for this protocol by the **IANA**.

The login process requires a name and password, which are defined by the systems administrator of the controlling equipment. This name and password is usually associated to the name and password of an administrator account.

D.3.3 Basic Protocol

All bytes within a command are printable ASCII characters, less than ASCII code 127. In this context, the Carriage Return (cr) and Line Feed (lf) characters are considered printable.

All messages from controller to target require a response as indicated. This will be either to return data that has been requested by the controller, or to acknowledge reception of an instruction to change the configuration of the target.

D.3.4 Command Structure

Controller-to-Target							
Start of Packet	**Target Address**	**Address Delimiter**	**Instruction Code**	**Row Index (Optional)**	**Code Qualifier**	**Optional Arguments**	**End of Packet**
< ASCII code 60 (1 character)	1-4 characters	/ ASCII code 47 (1 character)	(3 characters)	1-3 characters contained with '[' ']' brackets	= or ? ASCII codes 61 or 63 (1 character)	(n characters)	Carriage Return and Line Feed ASCII codes 13 and 10 [0x0D, 0x0A] (2 characters)

Examples: <0135/TFQ=1949.2345{CR}

<1/rte[1]= rt1|239.022.033.044.32|1|**********|0011|0|0|0|0|3

Target-to-Controller						
Start of Packet	**Target Address**	**Address Delimiter**	**Instruction Code**	**Code Qualifier**	**Optional Arguments**	**End of Packet**
> ASCII code 62 (1 character)	(4 characters)	/ ASCII code 47 (1 character)	(3 characters)	=, ?, !, *,#, or ~ ASCII codes 61,63,33,42, 35, or 126 (1 character)	(From 0 to n characters)	Carriage Return, Line Feed ASCII codes 13,10 (2 characters)

Examples: >0654/RSW=32{CR}{LF}

<RTE[4]?

>0001/rte[4]=rt4|239.022.033.044.32|1|**********|0011|0|0|0|0|3

D.3.4.1 Start of Packet

Controller-to-Target: This is the character '<' (ASCII code 60).

Target-to-Controller: This is the character '>' (ASCII code 62).

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message. For multi line text message, each line should end with a new line character '\n'. The carriage return & new line [\r\n] combination should present only at the end of the message.

D.3.4.2 Target Address

Up to 9,999 devices can be uniquely addressed. Even though the any number of devices can be addressed, but they all should be associated with single IP Address.

- For a CDM-570, address of '1' is being used to address both modulator and demodulator.
- For CDD-564, each demodulator is identified by unique address from 1 to 4 respectively for all the four demodulators.

The address is not significant for commands targeted system wide. But, it does has significance when associated with demod specific commands like Frequency, data rate etc.

The Controller sends a packet with the address of a Target – the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.

D.3.4.3 Address Delimiter

This is the character '/' (forward slash) (ASCII code 47).

D.3.4.4 Instruction Code

This is a three-character alphabetic sequence that identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance.

For Example: TFQ for **T**ranmsit **F**re**Q**uency; **RMD** for **R**eceive **M**o**D**ulation type, etc. This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65 - 90).

D.3.4.5 Instruction Code Qualifier

This single character further qualifies the preceding instruction code. Code Qualifiers obey the following rules:

1. From **Controller-to-Target**, the only permitted values are:

= **(ASCII code 61**	The **=** code is used as the **assignment** operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. **For example:** In a message from Controller-to-Target, TFQ=0950.0000 would mean 'set the Tx frequency to 950 MHz'
? **(ASCII code 63)**	The **?** code is used as the **query** operator, and is used to indicate that the Target should return the current value of the parameter defined by the preceding byte. **For example:** In a message from Controller-to-Target, **TFQ?** would mean 'return the current value of the transmit frequency'.

2. From **Target-to-Controller**, the only permitted values are:

= **(ASCII code 61)**	**The = code is used in two ways:** **First**, if the Controller has sent a query code to a Target (**for Example: TFQ?**, meaning '*what is the Tx frequency?*'), the Target would respond with **TFQ=xxxx.xxxx**, where **xxxx.xxxx** represents the frequency in question. **Second**, if the Controller sends an instruction to set a parameter to a particular value, and if the value sent in the argument is valid, then the Target will acknowledge the message by replying with **TFQ=** (with no message arguments).

! **(ASCII code 33)**	**The ! code is only used as follows:** If the controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is not valid, the target will acknowledge the message by replying, for example, with **TFQ!** (with no message arguments). This indicates that there was an error in the message sent by the controller. If the controller sends an instruction code which the target does not recognize, then the target will acknowledge the message by echoing the invalid instruction, followed by the ! character. **Example: XYZ!** Right now the CDD software is not organized to categorize various error codes, so it combines various errors into a single code (!).

D.3.4.6 Optional Message Arguments

Arguments are not required for all messages. Arguments are ASCII codes for the characters 0 to 9 (ASCII codes 48 to 57); period (ASCII code 46); and comma (ASCII code 44); plus miscellaneous printable characters.

D.3.4.7 Table Support Qualifier

In order to support accessing information that is represented in a table, the following syntax is supported:

D.3.4.7.1 Index

The desired row shall be encapsulated within '[' and ']' brackets. This option is only applicable for data that is represented as table. For example:

Get a route table entry (will return the contents of the four route table entry):

```
<1/RTE[4]?
```

Get a the entry route table (will return the contents of the four route table entry):

```
$NumEntries = <0/RTN?

for($I=1, $I<$NumEntries, $I++)
{
  entryInfo[$I] = <0/RTE[$I]?
}
```

To add a new route table entry:

```
$NumEntries = <0/RTN?
$NewRouteEntry = $NumEntries + 1

<1/RTE[$NewRouteEntry]=
rt4|239.011.033.022.32|1|192.168.001.221|00ab|1|0|1|4|3
```

To modify an existing route table entry:

```
<1/rte[1]=
rt4|239.011.033.022.32|1|192.168.001.221|00ab|1|0|1|4|3
```

D.3.4.7.2 Argument Lists

In order to enforce atomic reads and writes and well as allow for checking related parameter for validity, multi-argument lists will have the following format:

- Arguments are positioned in fixed length format (see specification for each argument)
- '|' Is used to separate different argument values from each other.

D.3.4.8 End of Packet

Controller-to-Target: This is the 'Carriage Return' character (ASCII code 13).

Target-to-Controller: This is the two-character sequence 'Carriage Return' (ASCII code 13), and 'Line Feed' (ASCII code 10).

Both indicate the valid termination of a packet.

D.4 Commands and Queries

Unless otherwise specifically called out in the IP Commands section, the remaining commands are provided as part of the base modem command set and are defined in the ***CDM-570/570L Satellite Modem with Optional IP Module Installation and Operation Manual.***

Index Notes: Column 'C' = Command; **Column 'Q'** = Query: Columns marked '**X**' designate instruction code as *Command only*, *Query only*, or *Command/Query*.

CODE	C	Q	PAGE
ACD	X		D-8
ACE	X	X	D-8
ACL	X	X	D-8
ADP	X	X	D-8
ADU	X	X	D-8
ARD	X		D-18
ARN		X	D-18
ARP	X	X	D-18
BBI	X	X	D-20
BLI	X	X	D-20
CCA	X	X	D-20
DDK	X	X	D-8
DEK	X	X	D-8
DRA	X	X	D-18
DRM	X	X	D-8
DSR	X	X	D-15
DTG		X	D-15
EMO	X	X	D-9
ERT		X	D-28
ESC	X		D-28
ESM	X	X	D-14

CODE	C	Q	PAGE
ETM		X	D-14
ETT		X	D-28
HAD	X	X	D-14
HRA	X	X	D-9
HRR	X	X	D-9
HRU	X	X	D-9
ICV	X	X	D-18
IDT		X	D-26
IFT		X	D-27
IFW		X	D-21
IGE	X	X	D-9
IGQ	X	X	D-18
IGT		X	D-19
IMR	X	X	D-19
INM	X	X	D-19
IPA	X	X	D-14
IPM	X	X	D-14
IPS		X	D-26
IRI	X	X	D-19
IRO	X	X	D-19
IRQ	X	X	D-19
LPS	X		D-20

CODE	C	Q	PAGE
PFI	X	X	D-20
PRA	X	X	D-9
PRE	X	X	D-9
QML		X	D-15
QSA	X		D-29
QSC	X		D-29
QSD	X		D-17
QSE	X	X	D-9
QSM	X	X	D-17
QSN		X	D-17
QSR	X	X	D-16
QST		X	D-29
QTL	X	X	D-17
RCG		X	D-23
RED		X	D-23
RFD	X		D-21
RHE	X	X	D-10
ROP	X	X	D-10
ROU	X	X	D-10
RSC	X		D-26
RST	X		D-21
RTD	X		D-23
RTE	X	X	D-24
RTN		X	D-23
RWP	X	X	D-10
RWU	X	X	D-10

CODE	C	Q	PAGE
SCG		X	D-10
SCS	X		D-21
SDM	X	X	D-10
SDN	X	X	D-10
SIA	X	X	D-11
SPE	X	X	D-11
SRC	X	X	D-11
SRT		X	D-25
SSC	X	X	D-11
SSL	X	X	D-11
SSN	X	X	D-11
STA	X	X	D-11
STB	X	X	D-12
STT		X	D-25
STV	X	X	D-12
SWC	X	X	D-12
SWM	X	X	D-12
SWR		X	D-21

CODE	C	Q	PAGE
TDE	X	X	D-12
TET	X	X	D-12
THE	X	X	D-13
TLE	X	X	D-13
TPE	X	X	D-13
USI	X	X	D-22
UUT	X	X	D-22
WSC	X		D-25

D.4.1 IP Commands and Queries

D.4.1.1 Admin Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Access List Delete	ACD=x	1-byte numerical 1…4	Command only. Deletes the specified access list entry from the access list table in the form <1/ACD=x, where x is value of 1…4	ACD= ACD!	N/A	ACD=x [1..4] (see Description of Arguments)
Access List Enforcement	ACE=	1 byte, value of 0 or 1	Command or Query. Enables or disables access list enforcement, where: 0 = Disabled 1 = Enabled	ACE = ACE!	ACE?	ACE=x (see description of arguments)
Access Client List	ACL=	18 bytes, numerical	Command or Query. Sets the Access list entry, which contains a subnet and mask. Once access list is enabled, only devices from the allowed ranges are allowed to communicate with the modem, in the form xxx.xxx.xxx.xxx/yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (0-31) Returns 000.000.000.000/32 when a particular Access Client is not configured. **Example:** <1/ACL[1]=010.006.030.001.24	ACL = ACL!	ACL?	ACL=xxx.xxx.xxx.xxx.yy (see description of arguments)
Administrator Password	ADP=	11 bytes No spaces allowed.	Command or Query. Changes the administrator password. **Example:** ADP=comtech	ADP = ADP!	ADP?	ADP=xxxxxxxxxxx (see description of arguments)
Administrator UserName	ADU=	11 bytes No spaces allowed.	Command or Query. Changes the administrator username. **Example:** ADU=comtech **Note:** To activate the new user name, ADP must be issued **immediately** after ADU. Then query **ADU?** to see new value.	ADU = ADU!	ADU?	ADU=xxxxxxxxxxx (see description of arguments)
3xDES Decrypt Key	DDK[1..8]=	48 bytes, numerical	Command or Query. 3xDES decrypt key, where all are Hexadecimal digits. [0…F], a total of 48 Hex digits. **Example:** DDK:0=22222222222222224444444444444444666666666666666	DDK = DDK!	DDK[1..8]?	DDK=x [1..48] (see description of arguments)
3xDES Encrypt Key	DEK[1..8]=	48 bytes, numerical	Command or Query. 3xDES encrypt key [192-Bit], where all are Hexadecimal digits. [0…F], a total of 48 Hex digits. **Example:** DEK[1]=22222222222222224444444444444444666666666666666	DEK = DEK!	DEK[1..8]?	DEK=x [1..48] (see description of arguments)
Downlink Route All Multicast	DRM=	1 byte, 0 or 1	Command or Query. Enable/Disable Downlink Route All Multicast option, where: 0 = Disabled 1 = Enabled	DRM= DRM!	DRM?	DRM=x x – 0 or 1.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
EasyConnect Multicast Option	EMO=	1 byte, value of 0 or 1	Command or Query. **Valid only when in EasyConnect mode on CDM-570.** Enables or disables forwarding of multicast traffic while in EasyConnect mode, where: 0 = Disabled 1 = Enabled	EMO = EMO!	EMO?	EMO=x (see description of arguments)
Header Compression Refresh rate – All Others	HRA=	3 bytes	Command or Query. **Restrictions: CDM-570 only** Refresh rate for all other streams, where Header compression refresh rate = 1 to 600; Resolution=1 packet **Example:** HRU =50	HRA = HRA!	HRA?	HRA=xxx (see description of arguments)
Header Compression Refresh rate – UDP/RTP1	HRR=	3 bytes	Command or Query. **Restrictions: CDM-570 only** Refresh rate for UDP/RTP1 streams, where Header compression refresh rate = 1 to 600, Resolution=1 packet **Example:** HRR=50	HRR = HRR!	HRR?	HRR=xxx (see description of arguments)
Header Compression Refresh rate – UDP	HRU=	3 bytes	Command or Query. **Restrictions: CDM-570 only** Refresh rate for UDP only stream, where Header compression refresh rate = 1 to 600; Resolution=1 packet **Example:** HRU =50	HRU = HRU!	HRU?	HRU=xxx (see description of arguments)
IGMP enable/disable	IGE=	1 byte, value of 0 or 1	Command or Query. Enables or disables the IGMP feature, where: 0 = Disabled 1 = Enabled	IGE = IGE!	IGE?	IGE=x (see description of arguments)
Payload Compression Refresh rate	PRA=	3 bytes	Command or Query. **Restrictions: CDM-570 only** Refresh rate for all other streams, where Payload compression refresh rate = 1 to 600; Resolution=1 packet **Example:** PRU =50	PRA = PRA!	PRA?	PRA=xxx (see description of arguments)
Ping Reply Enabled	PRE=	1 byte, value of 0 or 1	Command or Query. Enables or disables ping reply, where: 0 = Disabled 1 = Enabled **Note:** When disabled, the modem will not respond to pings (network security feature)	PRE = PRE!	PRE?	PRE=x (see description of arguments)
Enable/Disable QoS Feature	QSE=	1 byte value 0 – Disable 1 – Enable	Command or Query. Sets the Quality of Service feature, where: 0 = Disabled 1 = Enabled	QSE= QSE!	QSE?	QSE=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
RX Header Compression enable/disable	RHE=	1 byte, value of 0, 1, 2 or 3	Command or Query. Enables or disables the Transmit 3xDES feature, where, 0 = Disabled 1 = Enabled **Restriction:** *Cannot* enable if the 3xDES FAST feature has not been purchased	RHE = RHE!	RHE?	RHE =x (see description of arguments)
ReadOnly Password	ROP=	11 bytes No spaces allowed.	Command or Query. Changes the ReadOnly password. **Example:** ROP =comtech	ROP = ROP!	ROP?	ROP=xxxxxxxxxxx (see description of arguments)
ReadOnly UserName	ROU=	11 bytes No spaces allowed.	Command or Query. Changes the ReadOnly username. **Example:** ROU=comtech **Note:** To activate the new user name, **ROP** must be issued **immediately** after **ROU**.	ROU = ROU!	ROU?	ROU=xxxxxxxxxx (see description of arguments)
ReadWrite Password	RWP=	11 bytes No spaces allowed.	Command or Query. Changes the ReadWrite password. **Example:** RWP=comtech	RWP = RWP!	RWP?	RWP=xxxxxxxxxxx (see description of arguments)
ReadWrite UserName	RWU=	11 bytes No spaces allowed.	Command or Query. Changes the ReadWrite username. **Example:** RWU=comtech **Note:** To activate the new user name, **RWP** must be issued **immediately** after **RWU**.	RWU = RWU!	RWU?	RWU=xxxxxxxxxxx (see description of arguments)
System Configuration Get	None	String of Variable byte size	Query only. Querying SCG? dumps the system configuration. This can be used for updating the GUI parameters. See the Appendix section for more information on individual field.	SCG= SCG!	SCG?	SCG=string of variable byte size.
SMTP Domain Name	SDM=	128 bytes, characters, no spaces	Command or Query. SMTP Domain name of up to 128 characters. **Note:** Entering an empty string will delete the domain name. To delete the domain name, issue <1/SDM= **Example:** SMTP=somedomainname	SDM = SDM!	SDM?	SDM=x [1..128] (see description of arguments)
SMTP Destination Name	SDN=	128 bytes, characters,	Command or Query. SMTP Destination name of up to 128 characters. **Note:** Entering an empty string will delete the destination name. To delete the destination name, issue <1/SDN= **Example:** <1/SMTP=somedestinationname	SDN = SDN!	SDN?	SDN=x [1..128] (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
SMTP Server IP Address	SIA=	15 bytes, numerical	Command or Query. Used to set the IP address of the SMTP server where mail should be sent, in the format xxx.xxx.xxx.xxx, where xxx.xxx.xxx.xxx is the IP address. **Example:** <1/SIA=010.006.030.001. **Note:** When not configured, it returns >0001/SIA=0.0.0.0	SIA = SIA!	SIA?	SIA=xxx.xxx.xxx.xxx (see description of arguments)
SNMP Enabled	SPE=	1 byte, value of 0 or 1	Command or Query. Enables or disables the snmp interface, where: 0 = Disabled 1 = Enabled **Note:** When disabled, the user will not be able to use the snmp interface.	SPE = SPE!	SPE?	SPE=x (see description of arguments)
SNMP Read Community	SRC=	255 bytes, characters, no spaces	Command or Query. Assigns SNMP read community string. **Example:** <1/SRC=public **Note:** Empty string is ***not*** allowed	SRC = SRC!	SRC?	SRC=x (see description of arguments)
SNMP System Contact	SSC=	128 bytes, characters,	Command or Query. Assigns SNMP System Contact string. **Example:** <1/SSC=Joe Net Admin. **Note:** If not configured it returns empty string. <1/SSC=	SSC = SSC!	SSC?	SSC=x [1..128] (see description of arguments)
SNMP System Location	SSL=	128 bytes, characters,	Command or Query. Assigns SNMP System Location string. **Example:** <1/SSL=Upstairs back right. **Note:** If not configured it returns empty string. <1/SSL=	SSL = SSL!	SSL?	SSL=x [1..128] (see description of arguments)
SNMP System Name	SSN=	128 bytes, characters,	Command or Query. Assigns SNMP System Name string. **Example:** <1/SSN=Remote1. **Note:** If not configured it returns empty string. <1/SSN=	SSN = SSN!	SSN?	SSN=x [1..128] (see description of arguments)
SNMP Trap Destination IP Address	STA=	15 bytes, Numerical	Command or Query. Sets the IP address of the SNMP Trap destination IP Address where traps will be sent, in the format xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx is the IP addresss **Example:** <1/STA=010.006.030.001 **Note:** If not configured it returns >0001/STA=0.0.0.0	STA = STA!	STA?	STA=xxx.xxx.xxx.xxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
SNMP Trap Destination IP Address-2	STB=	15 bytes, Numerical	Command or Query. Sets the IP address of the SNMP Trap destination IP Address where traps will be sent, in the format xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx is the IP addresss **Example:** <1/STA=010.006.030.001 **Note:** If not configured it returns >0001/STB=0.0.0.0	STB = STB!	STB?	STB = xx.xxx.xxx.xxx (see description of arguments)
SNMP Trap Version	STV=	1 byte, value of 0 or 1	Command or Query. Specifies the version of SNMP traps that should be sent, where: 1 = Snmpv1 2 = Snmpv2	STV = STV!	STV?	STV = x (see description of arguments)
SNMP Write Community	SWC=	255 bytes, characters, no spaces	Command or Query. Assigns SNMP write community string. **Example:** <1/SWC=public **Note:** Empty string is ***not*** allowed	SWC = SWC!	SWC?	SWC =x (see description of arguments)
System Working Mode	SWM=	1 byte, value of 0 through 1	Command or Query. Sets the system working mode, where: 1 = Router - Small Network 2 = Router - Large Network 3 = Router - Point to Point 4 = Router - Vipersat 5 = EasyConnect. **Note:** Router-Vipersat mode needs the Vipersat option to be available on the modem. Changing the address/working mode may reboot the modem.	SWM= SWM!	SWM?	SWM =x (see description of arguments)
Transmit DES enable/disable	TDE=	1 byte, value of 0, 1, 2 or 3	Command or Query. Enables or disables the Transmit 3xDES feature, where: 0 = Disabled 1 = Enabled (EasyConnect Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) **Note:** Acts as command only in EasyConnect mode; on router mode, it is read-only. **Restriction:** Cannot enable if the 3xDES FAST feature has not been purchased.	TDE = TDE!	TDE?	TDE =x (see description of arguments)
Telnet timeout	TET=	2 bytes	Command or Query. Defines inactivity timeout on CLI menu screen, where Telnet login timeout = 1 to 60; Resolution=1 minute **Example:** <1/TET=50	TET = TET!	TET?	TET =xx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
TX Header Compression enable/disable	THE=	1 byte, value of 0, 1, 2 or 3	Command or Query. Enables or disables the Transmit 3xDES feature, where: 1 = Enabled (EasyConnect Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) **Note:** Acts as command only in EasyConnect mode; in router mode, it's read-only. **Restriction:** Cannot enable if the 3xDES FAST feature has not been purchased.	THE = THE!	THE?	THE =x (see description of arguments)
Telnet Enabled	TLE=	1 byte, value of 0 or 1	Command or Query Enables or disables the telnet interface, where: 0 = Disabled 1 = Enabled **Note:** When disabled, the user will not be able to log in to the telnet interface.	TLE = TLE!	TLE?	TLE =x (see description of arguments)
TX Payload Compression enable/disable	TPE=	1 byte, value of 0, 1, 2 or 3	Command or Query Enables or disables the Transmit 3xDES feature, where: 0 = Disabled 1 = Enabled (EasyConnect Only mode) 2 = PerRoute (read-only when FAST feature is purchased in router mode) 3 = Unavailable (read-only when FAST feature not purchased) **Note:** Acts as command only in EasyConnect mode; in router mode, it's read-only. **Restriction:** Cannot enable if the 3xDES FAST feature has not been purchased	TPE = TPE!	TPE?	TPE =x (see description of arguments)

D.4.1.2 Interface Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Ethernet speed mode	ESM=	1 byte, value of 1..5	Command or Query. Specifies the speed and mode of Ethernet interface, where: 1 = Auto 2 = 10 MB/sec Half Duplex 3 = 100 MB/sec Half Duplex 4 = 10 MB/sec Full Duplex 5 = 100 MB/sec Full Duplex	ESM = ESM!	ESM?	ESM = x (see description of arguments)
Ethernet MAC	NONE	12 bytes	Query only. Returns the Ethernet MAC address. **Example:** ETM=0006B0000178	ETM!	ETM?	ETM=xxxxxxxxxxxx (see description of arguments)
HDLC Address	HAD	4 bytes, Numerical	Command or Query. Sets the one of four HDLC addresss, where: In small network mode, value is 0x01-0xFE In large network mode, value is 0x0001-0x7FFE To delete, set the value to 0xFFFF. **Examples:** <1/HAD[3]=AB will set the HDLC address to 0xAB <1/HAD[2]=FFFF will Clear/Delete the HDLC Address. **Note:** In Point-to-Point or Vipersat modes, the values are not used.	HAD= HAD!	HAD?	HAD= xxxx (see description of arguments)
IP Address of Ethernet interface	IPA=	15 bytes length.	Command or Query. Sets the IP address and mask of the Ethernet interface, in the format: xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx is the IP address. **Example:** 010.006.030.001 **Notes:** To make the IPA= command effective, one needs to issue the IPM command immediately following IPA command. IPM should be issued even if there is no change in the subnet mask. Changing the IP address will cause the telnet/socket connection to break. So, the telnet/application should reconnect to the new IP address after timeout. For Reading also, IPA? is followed by IPM?	IPA = IPA!	IPA?	IPA= xxx.xxx.xxx.xxx (see description of arguments)
IP Address Mask of Ethernet Interface	IPM=	Value of 8 – 32	Command or Query. Sets the IP Subnet mask for the interface IP address, where: yy is the submet mask in bits [8..32] Refer to IPA **Notes**	IPM= IPM!	IPM?	IPM=yy

D.4.1.3 QoS Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
DiffServ Rule	DSR=	48 bytes, numerical	Command or Query. **Note:** To set DSR, the system has to be set in DiffServ mode by issuing <1/QSM=3. The value in this is broken into separate values: **Read/Get Format:** cccc|ddd ddd|mmmmm|MMMMM|p where: cccc = DiffServ class name ddd ddd = DiffServ Code Point. The code point has 0, 1, X mmmmm = Minimum bandwidth in kbps (range = 0..99999 kbps) MMMMM = Maximum bandwidth in kbps (range = 0..99999 kbps) p = priority is fixed and assigned by system. User is allowed to modify Assured Class Rules 9, 10, 11, 12 ONLY, while the QoS [QSM=3] is in DiffServ mode. **Write/Set Format** **Example:** DSR[9]=00100|00400 Sets min bw to 100, max bw to 400.	DSR= DSR!	DSR?	DSR =x [1..48] (m = Min value, M = Max value)
DiffServ Table Get	DTG?	String of DiffServ Table	Query only. Displays the complete diffserv rules. Can be issued when QoS mode is set in Diff Serv. There are 12-rows/rules. Each rule is separated by chr(13). >0001/DTG=chr(13) EXFD|101 110|00000|99999|1chr(13) CLS1|001 000|00000|99999|1chr(13) CLS2|010 000|00000|99999|2chr(13) CLS3|011 000|00000|99999|3chr(13) CLS4|100 000|00000|99999|4chr(13) CLS5|101 000|00000|99999|5chr(13) CLS6|110 000|00000|99999|6chr(13) CLS7|111 000|00000|99999|7chr(13) ASF1|001 xx0|00011|01111|8chr(13) ASF2|010 xx0|00022|02222|8chr(13) ASF3|011 xx0|00000|99999|8chr(13) ASF4|100 xx0|00000|99999|8chr(13)chr(10)	DTG= DTG!	DTG?	DTG=sssss…..ss Display all 12 diffserv rules.
QoS Maximum System Latency	QML=	1-Byte value 0 – 5000 ms.	Query only. Gets the QoS typical system latency Value range from 0 – 5000 mSec.	QML = QML!	QML?	QML=x x = A value of 0-5000 ms

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
QoS Rule	QSR=	QSR[0..32]= **Index-0 is the default rule**	Command or Query. QSR=tt|p|sss.sss.sss.sss/ss|ddd.ddd.ddd.ddd/dd|AAAAA|BBBBB|CCCCC|DDDDD|mmmmm|MMMMM|w|f Where t = Protocol Type: 01 - UDP 02 - TCP 03 - ICMP 04 - RTP 05 - VOCE 06 - VDEO 07 - RTPS 08 - FTP 09 - HTTP 10 - TELN 11 - SMTP 12 - SNMP 13 - SAP 14 - ORCL 15 - CTRX 16 - SQL 17 - IP 18 - N-IP 19 - ALL [Valid only for default rule] Where p = PRI=1..8 (only applies in max/priority mode). In Min/Max mode priority for all rules is fixed at 8. User should not be alled to change priority in Min/Max mode. Priority-9 is being used for default rule, and obtained from PARAM file. Pri-9 cannot be used for configuring other rules. Where s = Source IP SIP=xxx.xxx.xxx.xxx/yy [yy – subnet mask]. All '*' signifies all IP address range[***.***.***.***/**]. Where d = Destination IP DIP=xxx.xxx.xxx.xxx/yy [yy – subnet mask]. All '*' signifies all IP address range, like [***.***.***.***/**] All '*' signifies all port range of 00000 – 65535 for TCP/UDP. All port numbers should in fixed length of 5-chars Where A = TCP/UDP Source Port range SPS=aaaaa [Source Port range Start] Where B = [Source Port range Finish] SPF=bbbbb Where C = [Dest Port range Start] DPS=ccccc Where D = [Dest Port range Finish] DPF=ddddd Where m = MINBW = mmmmm (meaningful in min.max mode). This is 0 in Max Priority mode. The number should be mentioned with preceding zeros, to make it a fixed length of 5-chars. Where M = MXB=MMMMM (meaningful in max/pri and min./max modes only). The number should be mentioned with preceding zeros, to make it a fixed length of 5-chars. W = WRED = 0-No 1-Yes F = FILTER = 0-No 1-Yes **Example:** >0001/qsr[1]=05|5|***.***.***.***/**|***.***.***.***/**|*****|*****|*****|*****|00000|22222|0|1 **Example:** [Default rule] **Note:** All QoS related commands can only be issued only when the system is in QoS-Max/Priority or QoS-Min/Max mode. It may return QSR! While not in any of these modes.	QSR = QSR!	QSR[0..32]? **Index-0 is the default rule**	QSR[0..32] = See Description of Arguments I**ndex-0 is the default rule**

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Delete a QOS Rule entry	QSD=	QSD =2bytes, numerical	Command Only. Deletes the QoS rule entry at the specified index number **Example:** QSD=3 (deletes the 3rd qos rule)	QSD = QSD!	N/A	QSD = xx (see description of arguments)
QoS mode	QSM=	1 byte, value of 1, 2 or 3.	Command or Query. QoS operating mode, where: 1 = Priority/Max 2 = Min/Max 3 = DiffServ **Example:** <1/QSM=2	QSM = QSM!	QSM?	QSM =x (see description of arguments)
Number of QOS Rule entries	QSN	QSN=2 bytes numerical	Query Only. Returns the number of active QoS rules. Does not count default rule. **Note:** This command should be issued whenever a new rule is added/deleted.	QSN = QSN?	QSN?	QSN = xxx (see description of arguments)
QoS Typical System Latency	QTL=	1-Byte value 0 – 5 Seconds.	Command or Query. Sets/Gets the QoS typical system latency. At low data rates of up to 1Mbps this value can range from 0 – 5 seconds. At data rates above 1Mbps, the value range from 0 – 2 seconds.	QTL = QTL!	QTL?	QTL=x x = value of 0-5 Seconds.

D.4.1.4 Protocol Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Delete an ARP entry	ARD=	ARD=xxx.xxx.xxx.xxx	Command Only. DeleteS the ARP entry associated with the specified IP Address. xxx.xxx.xxx.xxx IP address of ARP entry to delete. **Example:** <1/ARD=192.168.001.100	ARD = ARD!	N/A	ARD=xxx.xxx.xxx.xxx (see description of arguments)
Number of ARP entries	None	4 bytes, numerical	Query Only. Returns the number of static arp entries. **Note:** This command should be issued whenever a new ARP Entry is added/deleted.	ARN = ARN!	ARN?	ARN=nnnn (see description of arguments)
Static Arp table	ARP=	256 bytes characters	Command or Query. ARP Entry in format xxx.xxx.xxx.xxx|mm:mm:mm:mm:mm:mm where: xxx.xxx.xxx.xxx = IP address. mm:mm:mm:mm:mm:mm. = MAC Address. **Note:** Duplicate IP addresses are not allowed. They must also be locally attached (on the same subnet as the Ethernet interface). Using a different index with existing IP address may modify the existing ARP entry, rather than creating new one. **Example:** <1/arp[1]=010.020.030.040|00:11:ab:33:44:66 Returns >0001/ARP! When there is no ARP entry.	ARP = ARP!	ARP[1..256]?	ARP=x [1..256] (see description of arguments)
DHCP Relay IP Address	DRA=	15 bytes, numerical	Command or Query. Used to set the IP address of the DHCP Server, in the format xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx is the IP address **Example:** <1/DRA=010.006.030.001 Returns >0001/DRA=0.0.0.0 when not configured.	DRA = DRA!	DRA?	DRA = xxx.xxx.xxx.xxx (see description of arguments)
IGMP Client: Version	ICV	1 byte, 0 or 1	Command or Query. Set the IGMP Version for Unsolicited Reports, where: 0 = V1 1 = V2 Recognize IGMP Queries **Example:** ICV =0	ICV = ICV!	ICV?	ICV =xxx (see description of arguments)
IGMP Server: IGMP Query Period	IGQ=	IGQ=xxx Where xxx is 1 to 600	Command or Query Sets the IGMP Query period in seconds while modem acting as IGMP Server.	IGQ= IGQ!	IGQ?	IGQ=xxx xxx – value of 1 to 600.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IGMP View Table	None	String value	Query only. Displays the IGMP table with different states. To see the entries, the system should have the IGMP feature enabled, and should be properly configured to forward IGMP packets. See WEB interface for proper table format. **Note:** Not yet supported in 1.5.3 Release, will be available in next release.	IGT= IGT!	IGT?	IGT=sssssss Table of IP Addresses and their state information.
IGMP Server: IGMP Max Resp. Time	IMR=	IMR=xxx Where xxx is value of 1 to 598	Command or Query. Sets the Maximum response time for the IGMP Query in seconds. Should always be 2 less than query period. The range is 1 to (IGQ – 2). If IGQ is at 30, then IMR can be set from 1 through 28.	IMR= IMR!	IMR?	IMR=xxx xxx - value of 1 to 598.
IGMP Server: Number of Missed Responses	INM=	2 bytes, Numerical 1..30	Command or Query. Number of missed responses before leaving the IGMP Group. Configured from 1…30 **Example:** INM=15	INM = INM!	INM?	INM =xxx (see description of arguments)
IGMP Client: Unsolicated Report Internval	IRI=	2 bytes 0..25	Command or Query. Sets the unsolicited Report Interval [Modem as Client], where: Range = 1..25 **Example:** <1/IRI=14	IRI = IRI!	IRI?	IRI =xxx (see description of arguments)
IGMP Client Router Alert Option for V1	IRO=	1 byte, 0 or 1	Command or Query. Enables/Disables Router Alert option for V1 Reports, where: 0 = No 1 = Yes **Example:** IRO =0	IRO = IRO!	IRO?	IRO =xxx (see description of arguments)
IGMP Client Recognize Queries	IRQ=	1 byte, 0 or 1	Command or Query. Enable/Disable Recognizing IGMP Queries, where: 0 = No 1 = Yes **Example:** IRQ=0	IRQ = IRQ!	IRQ?	IRQ =xxx (see description of arguments)

D.4.1.5 Operations and Maintenance Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Base Modem Boot From	BBI=	1 byte value 0,1,2	Command or Query. The binary image, which will be used by the base modem, to boot with, where: 0 = Latest 1 = Image in Slot# 1 2 = Image in Slot#2. **Example:** <1/BBI=0	BBI= BBI!	BBI?	BBI=x (see description of arguments)
Boot From Software Image	BLI=	1 byte, value of 0,1,2	Command or Query. Image which will be used the next time the system is booted, where: 0 = Latest 1 = Bulk Image # 1 2 = Bulk Image # 2 **Example:** BLI=1 (which is Image #1 active)	BLI = BLI!	BLI?	BLI =x (see description of arguments)
Codecast Multicast Address	CCA=	Multicast IP Address in xxx.xxx.xxx.xxx format	Command or Query. Sets the Code cast multicast address, through which the modem can receive the software updates via vLoad application. Only Multicast address in the range 224.xxx.xxx.xxx To 239.xxx.xxx.xxx are allowed. There are some reserved multicast addresses which cannot be used. This cannot be deleted.	CCA= CCA!	CCA?	CCA=xxx.xxx.xxx.xxx (see description of arguments)
Load Params from permanent storage	LPS=	1-Byte value 1 – load parameters	Command only. Set to '1' to load the system with parameters from permanent storage/flash. This may force unit reboot, depending on the mode of operation.	LPS= LPS!	N/A	LPS=x (see description of arguments)
Param file image to use	PFI=	1 byte, value of 1 or 3	Command or Query. Image which will be updated the next time firmware is uploaded to the system: 1 = Param1 3 = Factory Default To restore the Factory Defaults, set **PFI=3** and issue **RST** to reset the box. This would bring up the box with factory default configuration. **Example:** PFI =1 (using param image on flash)	PFI = PFI!	PFI?	PFI =x (see description of arguments)

<table>
<tr><th>Parameter Type</th><th>Command (Instruction Code and Qualifier)</th><th>Arguments for Command or Response to Query</th><th>Description of Arguments</th><th>Response to Command</th><th>Query (Instruction Code and Qualifier)</th><th>Response to Query</th></tr>
<tr><td>IP Software Information</td><td>None</td><td>String</td><td>Query only.
Complete IP software information:
Example: FRW=
System time is THU DEC 22 14:53:50 2005
Booted using image #1
Using configuration parameters from PARAM #
<table>
<tr><th>Type</th><th>Date</th><th>Time</th><th>Name</th><th>Rev</th><th>Len</th></tr>
<tr><td>Boot</td><td>1/24/2006</td><td>15:26</td><td>FW/10873-1c</td><td>1.1.3</td><td>460804
chr(13)</td></tr>
<tr><td>IP Bulk#1</td><td>12/27/2005</td><td>17:27</td><td>5.3 Pre</td><td>1.5.3</td><td>2607240
chr(13)</td></tr>
<tr><td>IP Bulk #2</td><td>12/14/2005</td><td>14:19</td><td>5.3 Pre</td><td>1.5.3</td><td>2604308
chr(13)</td></tr>
<tr><td>EVENT LOG</td><td>02/01/2006</td><td>14:10</td><td>eventlog</td><td>1.5.3</td><td>128000
chr(13)</td></tr>
<tr><td>PARAM</td><td>1/26/2006</td><td>18:29</td><td>console</td><td>1.5.3</td><td>5160
chr(13)</td></tr>
<tr><td>BaseBoot</td><td>03/30/2004</td><td>-- --</td><td>FW/10804-1-</td><td>1.1.1</td><td>----
chr(13)</td></tr>
<tr><td>BaseBulk#1</td><td>01/26/2006</td><td>-- --</td><td>FW/10805T</td><td>1.5.1N</td><td>----
chr(13)</td></tr>
<tr><td>BaseBulk#2</td><td>01/04/2006</td><td>-- --</td><td>FW/10805R</td><td>1.5.1g</td><td>----
chr(13)
chr(10)</td></tr>
</table></td><td>IFW!</td><td>IFW?</td><td>IFW =x….x
(see description of arguments)</td></tr>
<tr><td>Restore Factory Defaults</td><td>RFD</td><td>1-Byte value
1 – restore</td><td>Command only.
Set to ‘1’ to bring the modem back to factory defaults. This may force unit reboot, depending on the mode of operation.</td><td>RFD=
RFD!</td><td>N/A</td><td>RFD=x
(see description of arguments)</td></tr>
<tr><td>Reset Unit</td><td>RST</td><td>1 byte value.
1 – reset system</td><td>Command only.
Set to ‘1’ to reset the system. Telnet2 connection needs to be re-established.</td><td>RST=
RST!</td><td>N/A</td><td>RST=x
(see description of arguments)</td></tr>
<tr><td>Save System Configuration Parameters</td><td>SCS=</td><td>1 byte value
1 – Save config</td><td>Command only
Set to ‘1’ to save all the active system configuration on to the Flash.</td><td>SCS=
SCS!</td><td>N/A</td><td>SCS=x
(see description of arguments)</td></tr>
<tr><td>Software Revision</td><td>N/A</td><td>34-37 bytes</td><td>Query only.
Returns the value of the internal software revision installed in the unit.
Example: >0001/SWR=Boot:1.1.1 Bulk1:1.5.1u Bulk2:1.5.1P</td><td>SWR!</td><td>SWR?</td><td>SWR=Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz
(see description of arguments)</td></tr>
</table>

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Upgrade Slot	USI=	1 bytes, value of 0,1, or 2	Command or Query. Slot to upgrade new IP firmware where: 0 = Oldest 1 = Image 1 2 = Image 2 **Example:** UPS=0	USI = USI!	USI?	USI=x (see description of arguments)
Unit Up Time	N/A	String value	Query only Displays the unit up time in days, hours, minutes & seconds. **Example:** >0001/UUT=0 days 0 hours 13 mins 15 secs	N/A	UUT?	UUT=sssssss (see description of arguments)

D.4.1.6 Redundancy Query

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Redundancy State	N/A	1 byte, value of 0 or 1	Query only. Returns the redundancy state of the unit, where 0 = Offline 1 = Online **Example:** RED=1 (which is Online)	N/A	RED?	RED=x (see description of arguments)

D.4.1.7 Routing Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Route Table Get	N/A	N/A	Query only. Gets the whole Routing Table of the modem. Each route entry is separated by '\r' [chr(13)] **Notes:** The route table will be displayed only if system's working mode is "Router –Small, Router-Large, Router-PtP. If the system is in EasyConnect mode, it may return **RCG!**	RCG!	RCG?	RCG= xxxxxxxxxxxxx xxxxxxxxxxxxx
Delete route entry	RTD=	RTD=4 bytes, numerical	Command Only. Deletes the route entry at the specified index number, if configured. **Note:** Returns **RTD!** if there is no route at the index.	RTD =	RTD!	RTD=xx.xx (see description of arguments)
Number of route entries	N/A	RTN=3 bytes, numerical	Query Only. Returns the number of route entries in the route table. **Note:** This command should be issued whenever a new route is added/deleted.	RTN = RTN!	RTN?	RTN=xxxx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Route Table	RTE	RTE[1..256]= variable	Command or Query. In the form sssssssssssss|ddd.ddd.ddd.ddd/DD|i|nnn.nnn.nnn.nnn|hhhh|t|p|c|k|S where: s = Route Name up to 13 characters. It should be unique. Reusing of route names with different index, will end up modifying the existing route. d = Destination IP Address in xxx.xxx.xxx.xxx/yy where: xxx.xxx.xxx.xxx is IP address and yy – Subnet mask bits. To mean 'Any IP Address' indicate it by ***.***.***.***/** format. D = Destination Subnet Mask Bits. i = Interface 1 – Sat and 0 – Ethernet n = Next Hop IP Address in xxx.xxx.xxx.xxx format. To be valid the next hop should be on the same subnet as the router IP Address. This field will be all '*' for a 'SAT' directed route. It means, for a route with valid HDLC address this field will be '***************'. h = HDLC Addr in 4-digit hexadecimal number. Valid range is 0x00 to 0xFE in Router-Small Network mode. and 0x0000 to 0x7FFE for Router-Large Network mode. This field will be all '*' for 'ETH' directed route, meaning if the route has a valid next-hop, then this field is '****' [meaning HDLC Address is not Used.]. HDLC Address is not used in point-to-point mode, may default to '1'. t = Header Compression 0 = No 1 = Yes. p = Payload Compression 0 = No 1 = Yes. c = DES Encryption 0 = No 1 = Yes. k = DES Key to use 0 = Don't use any key 1 – 8 = use as mentioned, and 9 = Use Random key. S = Multicast state 0 = None 1 = Eth-to-Sat 2 = Sat-to-Eth 3 = toBoth When called using an existing index, the command is treated as a "modify". Only new routes can be added at the END of the list: **Example:** RTN? RTN=3 <1/rte[3]=rt3|239.111.102.222.32|0|192.168.001.022|00AB|0|0|1|5|3 **Sat Directed Route:** >0001/RTE[1]=rt1|011.012.013.014/32|1|***.***.***.***|1111|0|0|0|0|0 **Eth Directed Route:** >0001/RTE[4]=rt4|012.013.014.015/32|0|192.168.001.111|****|0|0|0|0|0 **Note:** To be able to set/get the route entries, the system should be in the routing. It may return **RTE!** if system is in EasyConnect mode.	RTE = RTE!	RTE[1..256]?	RTE[1..256] = xxx (see description of arguments)

D.4.1.8 Statistics Commands and Queries

D.4.1.8.1 Wan Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments		Response to Command	Query (Instruction Code and Qualifier)	Response to Query
WAN RX: Statistics	None	10 bytes, Numerical	Query only. Displays all WAN Receive Statistics.		SRT!	SRT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
			WAN Rx Bad Address Count WAN Rx Pkt Proc CRC Errors WAN Rx Abort/Oclet Errors WAN Rx Overrun Errors WAN Rx HDLC CRC Errors WAN Rx HDLC Payload Byte Count WAN Rx HDLC Header Byte Count WAN Rx HDLC Packet Count WAN Rx Invalid FlowID Errors WAN Rx SAR Re-Assemble Errors WAN Rx Header Decomp errors WAN Rx Memory Alignment Errors WAN Rx Bad CRC Errors	[0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13)chr(10)			
WAN TX: Statistics	None	10 bytes, Numerical	Query only. Displays all WAN Transmit Statistics.		STT!	STT?	Text display of all WAN/Satellite Transmit Statistics. \r =CR = 0x0D \n = Newline = 0x0A
			WAN Tx Error – No Route WAN Tx Error – Packet Start WAN Tx Error – Packet Front Length WAN Tx Error – Packet End Length WAN Tx Packet Invalid Length WAN Tx Packet Dropped – Sat Overdriven WAN Tx HDLC Header Byte Count WAN Tx HDLC Payload Count WAN Tx HDLC Packet Count WAN Tx Utilization Ethernet Traffic Destined to WAN Actual Satellite Traffic (kbps) Percentage of WAN Bandwidth Saved	[0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13)chr(10)			
WAN Stats Clear	WSC=	1Byte Numerical	Command only. Set to ‘1’ to clear all WAN Statistics – clears both Transmit & Receive Stats.		WSC=	N/A	WSC= Clear WAN Stats.

D.4.1.8.2 IP Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Clear IP Route Statistics	RSC=	1Byte number 1 – Clear stats	Command only. Set this value to '1' to clear all IP Route Statistics – clears IP Route Stats, IP Filtered Stats, IP Dropped Stats.	RSC= RSC!	RSC?	RSC!
IP Dropped Statistics	None	10bytes numerical values	Query only. Displays all IP Route Dropped Packet Statistics in text. Dropped – Bad IP Header Checksum [0]chr(13) Dropped – Bad Buffer Length [0]chr(13) Dropped – Bad IP Version [0]chr(13) Dropped – TTL Expired [0]chr(13) Dropped – No Route [0]chr(13) Dropped – No ARP Entry [0]chr(13) Dropped – Multicast [0]chr(13) Dropped – Multicast Disabled Group [0]chr(13) Dropped – Total [0]chr(13)	IDT!	IDT?	Text display of all IP Dropped stats. \r =CR = 0x0D \n = Newline = 0x0A
IP Route Stats	N/A	10 bytes, Numericals	Query only. Displays all IP Route Packet Statistics in text. Total Packets From Etheret [58]chr(13) Total Packets To Ethernet [56]chr(13) Unicast Packets To Ethernet [56]chr(13) Multicast Packets To Ethernet [0]chr(13) Broadcast Packets To Ethernet [0]chr(13) Total Packets From Satellite [0]chr(13) Total Packets From Endstation [61]chr(13) Total Packets To Endstation [58]chr(13) IGMP Packets Received [0]chr(13) IP Option Packets Received [0]chr(13)chr(10)	IPS!	IPS?	Text display of all IP Route Stats. \r =CR = 0x0D \n = Newline = 0x0A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments		Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Filtered Stats	None	10 bytes, Numerical	Query only. Displays all IP Route Filtered Packet Statistics in text.		IFT!	IFT?	Text display of all IP Filtered stats. \r =CR = 0x0D \n = Newline = 0x0A
			Filtered – Boot	[8]chr(13)			
			Filtered – Flow Descriptor	[0]chr(13)			
			Filtered – Unknow Reason Code	[0]chr(13)			
			Filtered – Flow Correlator	[0]chr(13)			
			Filtered – Management Path	[0]chr(13)			
			Filtered – WAN Scaling	[0]chr(13)			
			Filtered – Ping	[0]chr(13)			
			Filtered – Access Control	[0]chr(13)			
			Filtered – Vipersat MCP	[0]chr(13)			
			Filtered – Vipersat UCP	[0]chr(13)			
			Filtered – Vipersat Remote	[0]chr(13)			
			Filtered – Codeload	[0]chr(13)			
			Filtered – Multicast	[0]chr(13)			
			Filtered – Bad Packet	[0]chr(13)			
			Filtered – Route	[0]chr(13)			
			Filtered – QoS Rule	[0]chr(13)			
			Filtered – Vipersat Loop	[0]chr(13)			
			Filtered – Bad Header Loop	[0]chr(13)			
			Filtered – Bad Data Ptr	[0]chr(13)			
			Filtered – MAC Split error	[0]chr(13)			
			Filtered – L3 Type Error	[0]chr(13)			
			Filtered – Local Destination	[0]chr(13)			
			Filtered – Redundancy Error	[0]chr(13)			
			Filter – ICMP Filter	[0]chr(13)			
			Filter – Port Error	[0]chr(13)			
			Filter - Total	[8]chr(13)chr(10)			

D.4.1.8.3 Ethernet Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments		Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Ethernet Rx Statistics	None	10 bytes, Numericals	Query only. Displays all the Ethernet Receive Statistics in text.		ERT!	ERT?	Text display of all Ethernet Receive statistics. \r =CR = 0x0D \n = Newline = 0x0A
			Ethernet Tx Bytes Ethernet Tx Good Frames Ethernet Tx Max Collision Count Etherent Tx Late Collision Count Ethernet Tx DMA Underrun Errors Ethernet Tx Lost Carrier Sense Count Ethernet Tx Deferred Count Ethernet Tx Single Collision Count Ethernet Tx Multicast Collision Count Ethernet Tx Total Collision Count	[0994]chr(13) [112]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13)chr(10)			
Clear Ethernet Stats	ESC=1	1byte number. 1 – Clear stats	Command only. Set value to ‘1’ to clear all the Ethernet Receive & Transmit Statistics.		ESC= ESC!	ESC?	ESC!
Ethernet Tx Statistics	None	10 bytes, Numericals	Query only. Displays all the Ethernet Transmit Statistics in text.		ETT!	ETT?	Text display of all Ethernet Transmit statistics. \r =CR = 0x0D \n = Newline = 0x0A
			Ethernet Rx Bytes Etherent Rx Good Frames Ethernet Rx CRC Error Frames Ethernet Rx Allignment Errors Ethernet Rx Resource Errors Ethernet Rx Collision Detect Errors Ethernet Rx Runt Frames Ethernet Rx Flow Control Pause Frames	[6786]chr(13) [91]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13) [0]chr(13)chr(10)			

D.4.1.8.4 QoS Stats

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Clear All QoS Queue Statistics	QSA=	QSA=x 1 – Clear all stats	Command only. Set QSA=1 to clear all QoS queue statistics. Also clears the default queue stats.	QSA= QSA!	None	QSA=x (see description of argument)
Quality of Service Stats Clear	QSC=xx xx=QoS rule index	xx – QoS rule index for which to clear stats.	Command only. Clears the QoS statistics for a specified queue. To clear default queue stats use '0'. **Examples:** <1/QSC=0 will clear default queue stats <1/QSC=5 will clear stats of rule-5. **Note:** The command can be issued only on active/configured queue.	QSC= QSC!	None	QSC=xx (see description of argument)
Quality of Service Statistics Get	N/A	String of QoS Stats	Query only. Displays the QoS queue statistics of all active queues, in the form: nnn|pp|aaaaaaaaaa|bbbbb|ccccccccc|ddddddddd|eeeeeeeee|fffff|ggggg|hhhhh|iiii where: n = QoS Rule Number p = Protocol number [Refer to QSR] a = Sent Packets b = Pkts per Second c = Sent Bytes d = Dropped Packets e = Dropped Bytes f = Current Transmit Rate [Kbps] g = Average Transmit Rate [Kbps] h = Maximum Transmit Rate [Kbps] I = Active Flow count associated with this QoS Queue. **Example:** >0001/QST= 0| 19| 0| 0| 0| 0| 0| 0| 0| 0| 0chr(13) 1| 0| 0| 0| 0| 0| 0| 0| 0| 0| 0chr(13)	QST!	QST?	QST=sssssssss… String displaying QoS stats of all active queues. \r – CR – 0x0D \n – Newline – 0x0A

D.5 Param Files

Param File Tag	Values Associated with Parameter
SYS_WORKING_MODE	Router Mode Easy Connect Mode
EASYCON_MCAST_MODE	Enabled Disabled
HDR_REFRESH_UDP_RTP1	Decimal Value of 1…600
HDR_REFRESH_UDP	Decimal Value of 1…600
HDR_REFRESH_ALL_OTHERS	Decimal Value of 1…600
PAYLOAD_REFRESH	Decimal Value of 1…600
TELNET_TIMEOUT	Decimal Value of 1…60 Minutes
QOSMODE	Rule-Max/Pri Mode Rule-Min/Max Mode DiffServ Mode
DYNBUF_LATENCY	Decimal value of 200 to 5000 mSec.
Rt#0 …. Rt#nnn	Route table entries Rt#0 is the first entry and can go upto 256 entries. [No need to read this from param file, use RTG]
ROUTE_HDLC_ADDR_SAVE	Corresponding HDLC Addresses for Ethernet→Sat entries. [No need to read this from param file, use RTG]
DHCP_RELAY_IP_ADDR	DHCP Server IP Address. Possible values are: NOT-DEFINED – When the parameter not set. 10.20.30.40 – When a DHCP Server IP Address is set.
REDUNDANCY_ACTIVE	Enabled Disabled
BASE_BOOT_IMAGE	Latest Image 1 Image 2
UPGRADE_SLOT	Oldest Image 1 Image 2
BLINDLOAD_MCAST_ADDR	NOT-DEFINED when ip_addr is 0 Valid multicast IP address like 239.4.5.6

Param File Tag	Values Associated with Parameter
ADMIN_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
READWRITE_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
READONLY_PWD	NONE – When not set Xxxx/yyy format with xxx-user name and yyy-password. Like comtech/comtech.
ACCESS_CLIENT	NOT-DEFINED/NA – When not set Valid IP address like 192.168.001.001/32
ACCESS_ENFORCEMENT_ENABLE	Enabled Disabled
PING_REPLY_ENABLE	Enabled Disabled
TELNETD_ENABLE	Enabled Disabled
SNMP_ENABLE	Enabled Disabled
IGMP_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
GENERIC_DOWNLINK_MCAST	Enabled Disabled
QOS_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled
TRANS_DES_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is EasyConnect Disabled – If system working mode is EasyConnect
TX_HDR_COMPRESSION_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is EasyConnect Disabled – If system working mode is EasyConnect
RX_HDR_COMPRESSION_ENABLE	Unavailable – If system does not has this FAST Feature available. Enabled Disabled

Param File Tag	Values Associated with Parameter
TX_PYLDCOMP_ENABLE	Unavailable – If system does not has this FAST Feature available. Per Route – If the system working mode is Router-Small, Router-Large, Router-PtoP Enabled – If system working mode is EasyConnect Disabled – If system working mode is EasyConnect
ENCRYPT_KEY# [0…7]	xxxxx….xx A 48 character length [192-Bit] 3xDES key. The key is formed with Hexadecimal digits from 0..9,A,B,C,D,E,F only. Like 2222222222222222 4444444444444444 6666666666666666. Notice there is a space for every 16-Hexadecimal digits for readability.
DECRYPT_KEY# [0…7]	xxxxx….xx A 48 character length [192-Bit] 3xDES key. The key is formed with Hexadecimal digits from 0..9,A,B,C,D,E,F only. Like 2222222222222222 4444444444444444 6666666666666666. Notice there is a space for every 16-Hexadecimal digits for readability.
SMTP_SERVER_IP_ADDRESS	NOT-DEFINED – If the parameter is not set. Other wise, IP address in the form 192.168.1.1
SMTP_DOMAIN	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character. Generally in domain name format.
SMTP_DESTNAME	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_READ_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like “public”
SNMP_WRITE_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like “private”
SNMP_TRAP_COMMUNITY	String of up to 20 characters. [Empty string is not allowed]. Like “public”
SNMP_TRAP_DEST	NOT-DEFINED – When the parameter is not set IP address in string format like 11.12.13.14
SNMP_TRAP_DEST_2	NOT-DEFINED – When the parameter is not set IP address in string format like 11.12.13.14
SNMP_TRAP_VERSION	SNMPv1 – When SNMP version-1 trap generation is selected. SNMPv2 – When SNMP version-2 trap generation is selected.
SNMP_TRAP_ENABLE_AUTHEN_TRAP	UNKNOWN – When invalid value is set. Enabled – When set to send the Authentication Trap. Disabled
SNMP_SYSCONTACT	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_SYSNAME	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.
SNMP_SYSLOCATION	Empty string, when not set. In param file, there is nothing after = sign. Otherwise, a string of up to 128 character.

Param File Tag	Values Associated with Parameter
ETHER_MAC	Ethernet MAC Address in the format 00-06-B0-xx-xx-xx. All are hexadecimal digits.
ETHER_SPEED_MODE	Auto 10 MB/sec Half Duplex 100 MB/sec Half Duplex 10 MB/sec Full Duplex 100 MB/sec Full Duplex
ETHER_IP_SNET	IP Address in the format 192.168.1.50/24
HDLC_ADDR_MODE	Small Network Mode Large Network Mode Point-To-Point Mode
QOSC	If there are no QoS rules configured, (or) system is not in Max-Pri (or) Min-Max mode, then param file will not have an entry for QOSC. Otherwise, the rules will be in the following format. QOSC### = SrcIP/Mask DstIP/Mask PROT spm spM dpm dpM mxB mb P W F QOSC#1 = ***/* ***/* RTP *** *** *** *** 22222 0 4 N Y QOSC#2 = 11.12.13.14/32 22.22.33.44/32 UDP 11111 22222 33333 44444 99999 0 0 Y N Where spm – source port min; spM – source port Max; dpm – Destination port min; dpM – Destination port Max mxB – Max bandwidth in kbps; mb – minimum bandwidth in kbps [Total aggregate min bandwidth of all the qos rules should be less than the Tx-Data rate of the system.] P – Priority; W – WRED; F – Filter; [Y – Yes, N – No]
QOSCDEFR	The default rule always exists in the system and in param file, but not meaningful if QoS mode is DiffServ. The format is QOSC### = SrcIP/Mask DstIP/Mask PROT spm spM dpm dpM mxB mb P W F QOSCDEFR#0 = ***/* ***/* ALL *** *** *** *** 99999 0 9 N N
DIFFSSV#0 … DIFFSSV#11	The DiffServ rules are meaningful only when QoS mode is DiffServ. Otherwise, these parameters can be discarded. The format is as follows. The first column is DIFFSSV#0 = 0 99999 NOTE: Donot use this from PARAM file, instead use DTG? Command.
IGMP_QRYP	A decimal value of 1…600
IGMP_MXRT	A decimal value of 1…598
IGMP_MRP	A decimal value of 1…30
IGMP_QUERIES	Yes No
IGMP_ROUTERALERT_OPT	Yes No

Param File Tag	Values Associated with Parameter
IGMP_VERSION2	V1 V2
IGMP_URI	A decimal value of 0…25
SARP#0 …. SARP#255	Static ARP entry if there are any, in the format IP Addr Layer2 MAC Address [Hexadecimal digits] 10.20.30.40 00:11:33:AA:BB:CC
MGC_SAVE	MGC Command response from the base modem. See the base modem document for more detail.
OGC_SAVE	OGC Command response from the base modem. See the base modem document for more detail.
LOGGING FEATURE	Enabled Disabled
LOGGING LEVEL	Errors Only Errors and Warnings All Information
HDLCADDR_SAVE	HDLC addresses in hexadecimal format aaaa bbbb cccc dddd … where: aaaa – First HDLC Address bbbb – Second HDLC Address…etc

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

Formulas
° C = (F - 32) * 0.555
° F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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480 • 333 • 2161 FAX